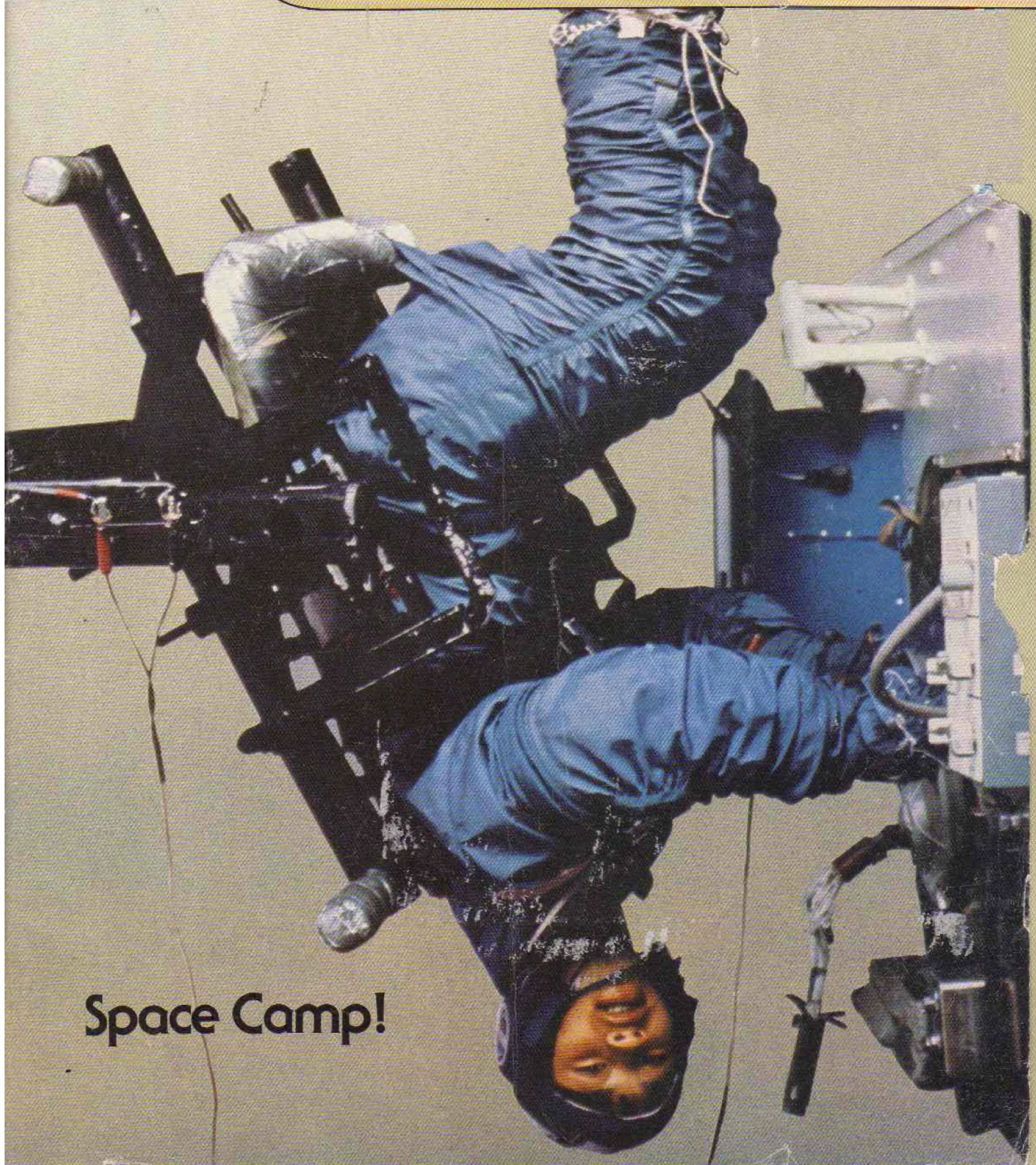


A Science Magazine from CTW, the Creators of Sesame Street.

321 CONTACT



Space Camp!



Baaa?

Shouldn't that be "woof"? Not for this dog. It may not look or sound like a sheep, but it thinks it is a sheep.

Robin, a star of 3-2-1 CONTACT's television show, went to a farm where she met some dogs that are trained to think and act like sheep. The dogs spend all day in the pasture with the woolly critters. In that way, they act like guard dogs, keeping the sheep safe.

Robin's visit to the farm is part of our show's survival week. Check your local listings to find out when you can watch CONTACT. Meanwhile, learn more on survival right here. You can start by reading about other animals that are mimics. Their copycat abilities help them survive in the wild. For more on that, turn to page 16.

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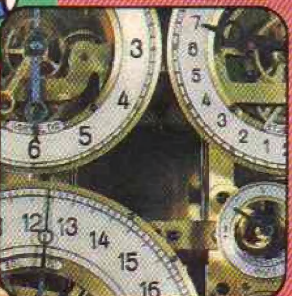
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3-2-1 CONTACT

Featuring This Month

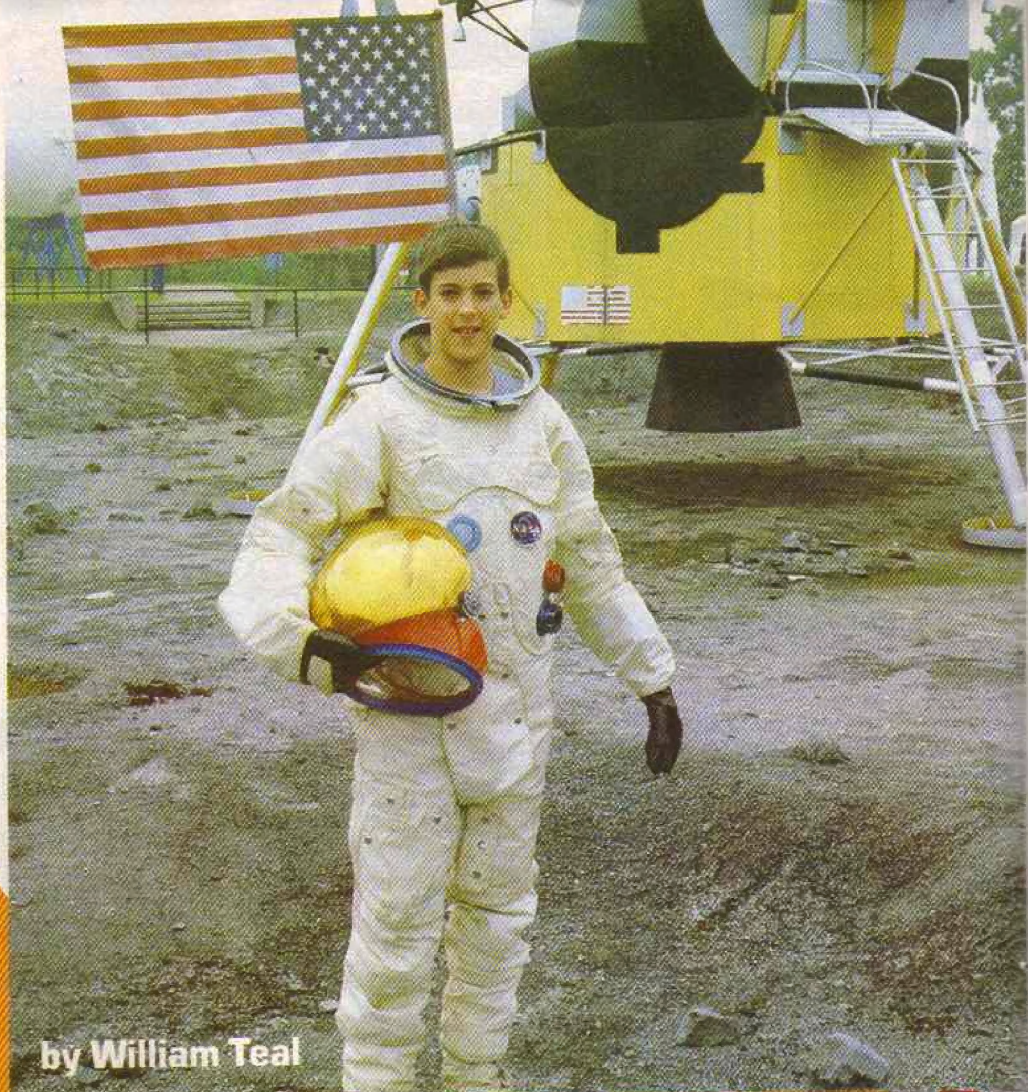
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Front Cover: Which way is up? The upside-down camper is getting an idea of what it's like to move around in the weightlessness of space. The special chair is part of the action at Space Camp in Huntsville, Alabama.

Right: Welcome to Space Camp! Get ready to launch into a five-day sample of life in space. Imagine what it would be like to walk on the moon!



by William Teal

3 2 1 BLAST OFF!

A CAMP THAT PUTS KIDS INTO ORBIT

Imagine that you are a crew member on the space shuttle. You are zooming through space at thousands of miles an hour. Suddenly, the cockpit computer screen flashes—DANGER! A damaged container in the cargo bay is releasing deadly radioactive fluid. Should you end the mission and return to earth? Or should you see if the damage must first be repaired? To find out, you have to take a space walk. Your heart is racing as you put on your space suit and step out of the cabin. But you are not in space at all.

You're at Space Camp, in Huntsville, Alabama. It's at the world's largest space museum, the Alabama Space and Rocket Center. You're taking part in a training course for kids who want to know what it takes to survive in space.

A Far-Out Experience

Kids ages 12 to 14 come from all over the United States to attend Space Camp. They have a special interest in science and need a teacher's recommendation to join. About \$300 covers expenses for the five-day summer course.

At the camp, kids climb aboard and train on equipment that was once used by NASA astronauts. After all, learning how to survive in space is not just something you can read about. Most of the equipment imitates the kind of action that would occur in space.

For instance, one machine imitates a space capsule. Another teaches astronauts how to walk on the moon. By practicing on such equipment, astronauts are fully prepared when it's

time for the real thing.

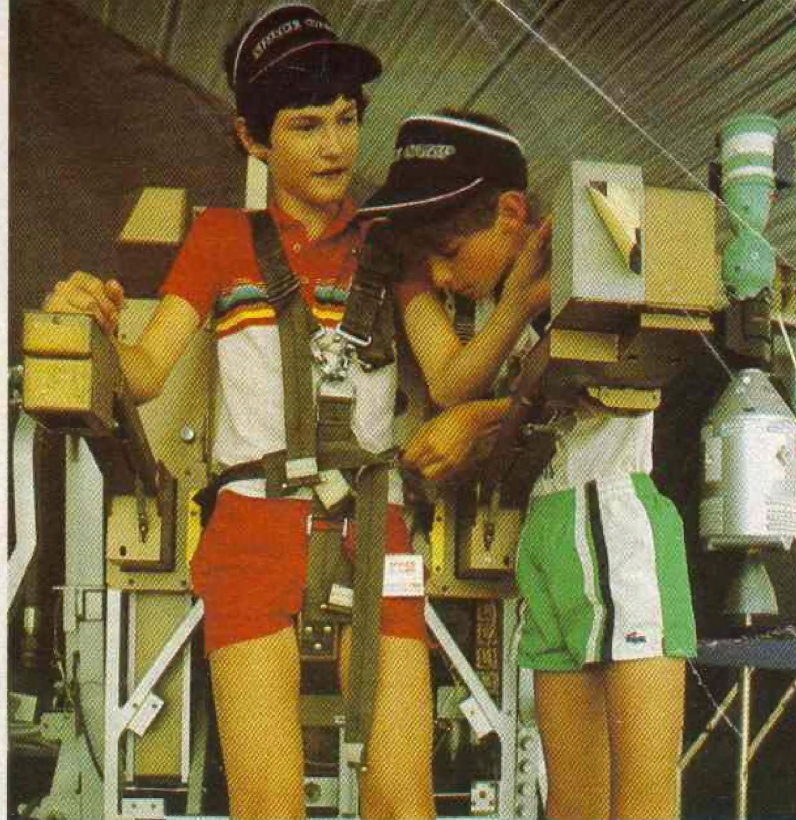
At the space center, campers start their own preparation with some basic training. Day one is *rocketry day*. It begins early as counselors rouse campers from bed in the museum dormitory. After morning exercises—the same kind the astronauts do—campers separate into groups of 10-member teams. Now they are ready to work with Plato, the camp computer.

Without computers, space flight would be impossible. Even some of the calculations needed to get off the ground would take weeks to complete with only pencil and paper. Soon, campers use Plato to figure out how to build model rockets. Of course, the model rockets that the kids build, and launch later in the week, don't have nearly as much power as space rockets. But they work the same basic way.

Living in Space

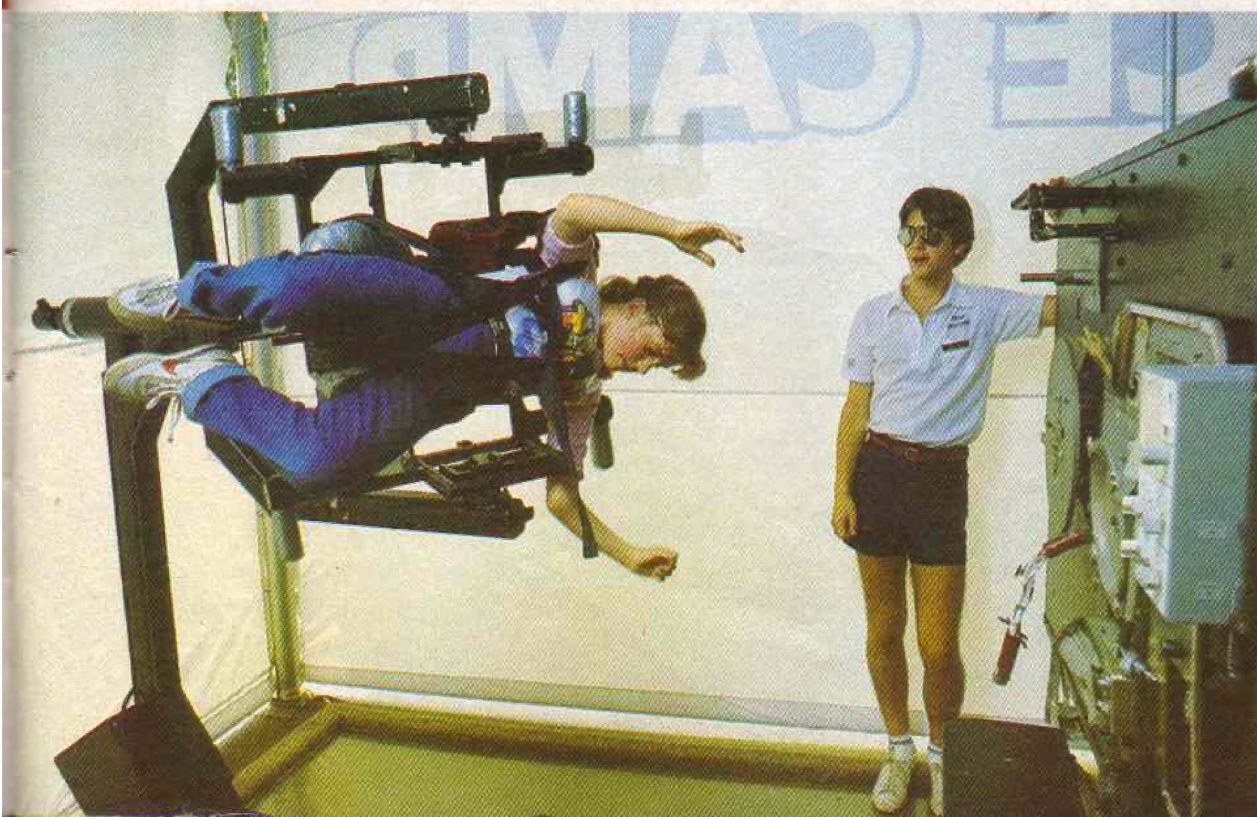
On the second day of camp, the kids get a taste of space life. They sample the same freeze-dried food the astronauts eat. But kids planning to go to the moon will have to know more than how to add water to freeze-dried food. For instance, they'll have to know how to drive a moon buggy. Campers try out the space car on a model of the moon's landscape. The buggy chugs along at 10 miles (16 km) an hour. Even though you can't quite zoom around, it's fun.

But life in space can also be dangerous. To survive the lack of air, for example, astronauts depend on an important piece of equipment—a



Above: The Manned Maneuvering Unit (MMU) straps on like a backpack. The MMU's rocket jets will help astronauts move around outside the space shuttle.

space suit. Campers try on suits similar to those worn by astronauts who visited the moon. The space suit's 21 layers did a great job of protecting astronauts from the hot and cold temperatures. Today's space shuttle suits are much less bulky, but they protect just as well from the extremes of space. ➡



Left: At Space Camp, kids find out how difficult it is to move around when you're weightless. This machine imitates the movement of walking in space.

Besides becoming accustomed to wearing a space suit, astronauts have to get used to feeling weightless. On day three, gravity-no gravity day, campers get the chance to feel what it's like, too. The action takes place on a zero-gravity machine. It looks like a giant teeter-totter, with a seat at one end and heavy weights at the other. When a camper is in the seat, the weights are adjusted to counterbalance her weight. She pushes off the ground with her feet and—hold on!—she feels a floating sensation. It's almost like being weightless, but not quite!

Later that day, the kids haul out their swim suits. It's time to train for an old-fashioned recovery at sea, just in case of an emergency shuttle splashdown. In a pool they try to climb from the water into a rubber raft without turning it over. From the raft they climb into a cage suspended over the pool. It feels as if it were hanging from a rescue helicopter at sea. The exercise isn't easy, even in shallow water. For astronauts, it would be more difficult during a real emergency in the ocean. But with enough practice, astronauts can be ready for anything.

Right: In a pool, campers learn how to get ready for an emergency splashdown recovery at sea.



Left: This may look like an amusement park ride. But it's part of the weightless training equipment. Campers just strap in and away they go!

Robot Helpers

To give the astronauts a hand, there are robots. These mechanical helpers make it easier for the space crew to do their work. If you watched the space shuttle missions on television, you may have seen the astronauts guide a robot arm to lift equipment out of the cargo bay. On day four, *technology day*, campers learn how to manipulate the same kind of robot arm.

When the campers finish their basic training, they're ready for day five, *mission day*. It's time for the campers to simulate sending their own shuttle flight into space. The 10 members of each team work hard to complete this final test at Space Camp.

Five members of each team act as mission



control—the people who guide the flight from the ground. Five campers are assigned to positions in the make-believe shuttle cockpit. Each camper has a job to do. On a real shuttle team, some astronauts are pilots and some are scientists with their own experiments to complete.

Shortly after the simulated shuttle's lift-off, Plato the computer signals that a container in the cargo bay is damaged. Campers must walk in space to solve the problem. After they do, the mission is over.

Finally, the crew comes down to earth. They gather to discuss the flight. When it's all over, the kids receive certificates of graduation. And they each get a pair of Space Camp wings that they proudly pin on their shirts.

For some of the campers, their week at Space Camp could be just the beginning. Maybe one day they will live in colonies on the moon. Or maybe they'll live in huge space stations orbiting the earth. But whether they ever live in space or not, their week at Space Camp was out of this world!

Right: Early in the week, campers build their own model rockets. Later, the rockets are ready to take off!



After a week of training, the kids complete the final mission at Space Camp. In the Apollo command capsule, they imagine they're working in space.

Factoids

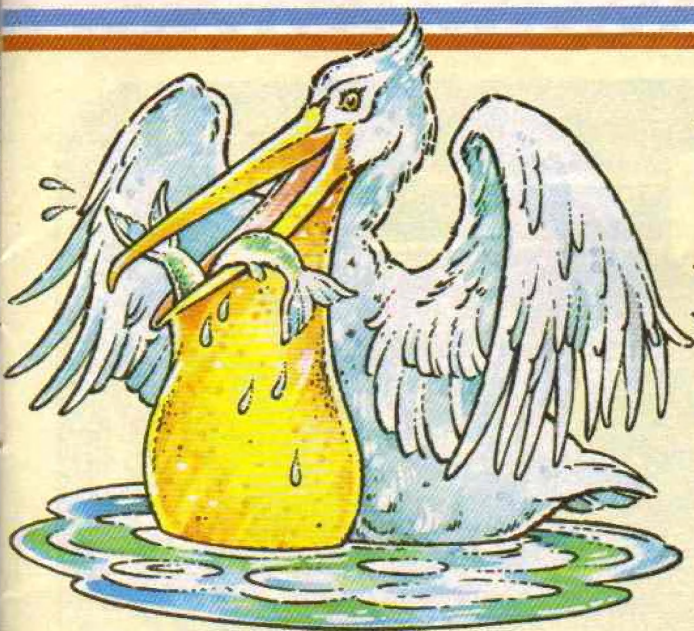
In the summer of 1978, Rena Clark and Jeff Block rode a ferris wheel for 37 days in San Jose, California—a record!



Americans eat three times more peanut butter than jelly.



The heaviest horse on record was a Belgian stallion named "Brooklyn Supreme." It weighed more than one and a half tons and was six and a half feet tall.



A pelican's bill pouch can stretch enough to hold 12 quarts of water.

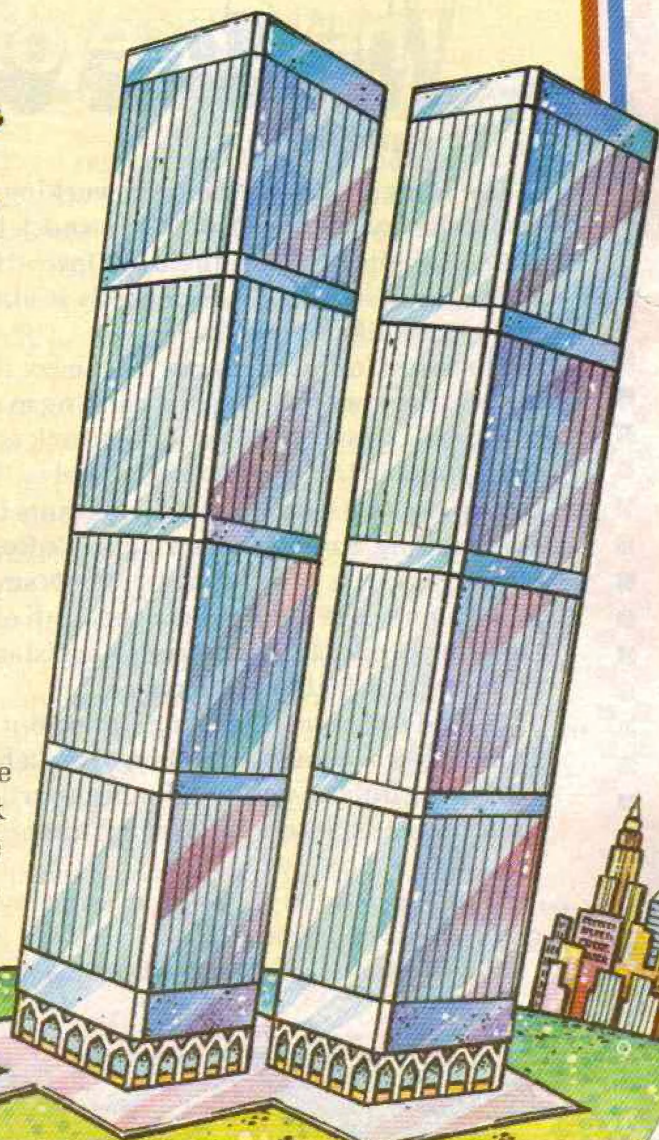


The Republic of Tadzhikistan in the U.S.S.R. has the most earthquakes on earth—about six a day.

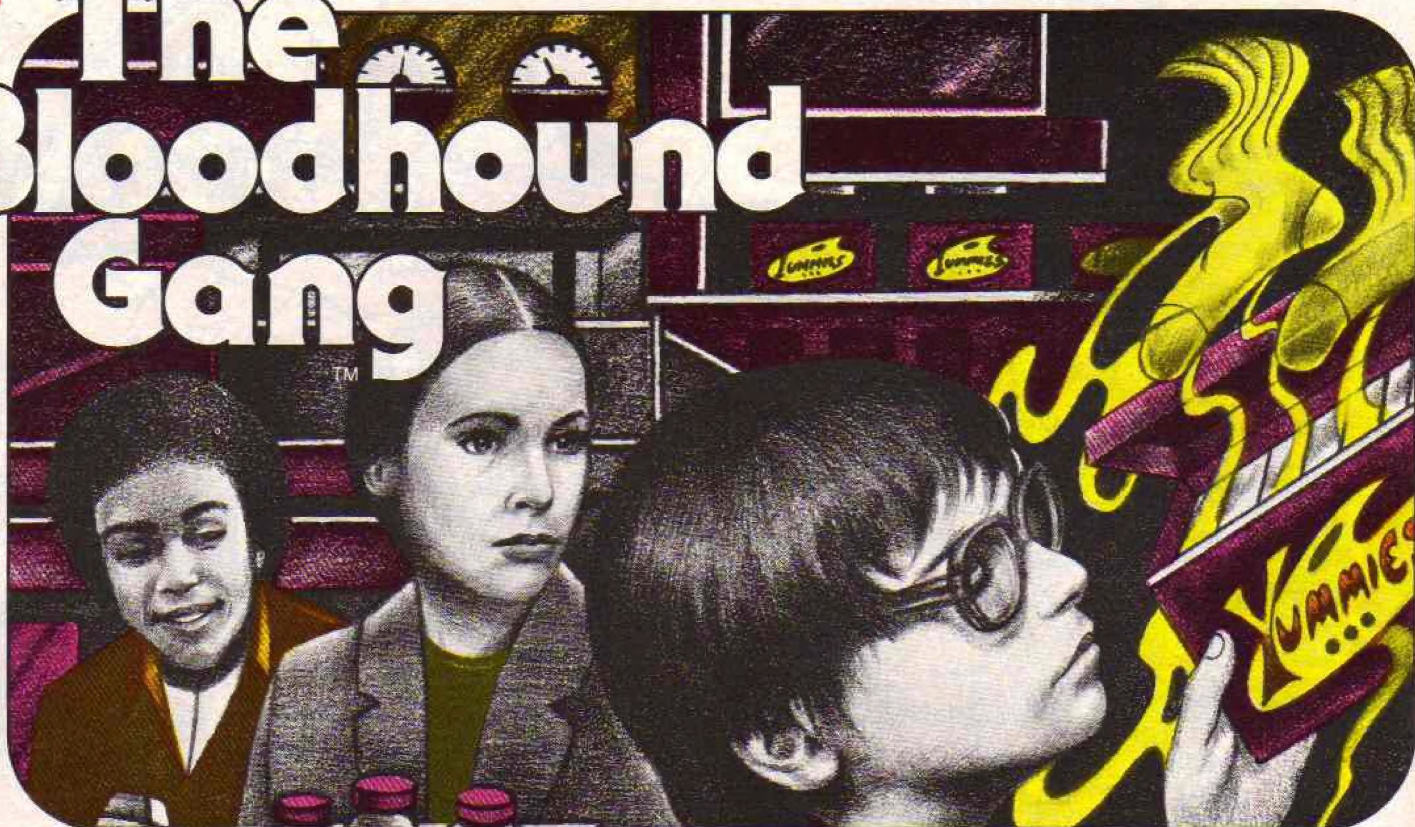


The lowest average temperature in the U.S. is 9.3° Fahrenheit in Barrow, Alaska. It gets below freezing 323 days a year.

New York's World Trade Center has enough concrete to pave a sidewalk from New York to Washington, D.C., a distance of over 200 miles.



The Bloodhound Gang



The Case of the Private Nose

Part Two

by Bill McCay

The story so far: The Gang is working for Simon Leazy, vice-president of a snack food company. His latest brainchild, Down-Home Yummies, is a problem. Somebody is making them smell like old socks.

There are lots of suspects. Mr. Leazy fired all the box packers to bring in a packing machine, the Robox. They could be getting back at him. Then there is J. Pierpont Grell, head of the Group Against Goo (G.A.G.). He wants Leazy to stop making Yummies. Or maybe it's Rose "The Nose" Parker, a chemist who invents smells and flavors. She has a whole shelf full of bad-smelling products. Even Leazy's assistant, Rip Offenback, is jealous of his boss.

To find out more, the Gang staked out the Yummies warehouse, watching from a high walkway. But the walkway came apart, dumping them into a vat of raw Yummies!

The Gang landed with a splosh in grayish gunk. "This goo smells horrible," Vikki gasped. Ricardo sputtered. "Tastes horrible, too.

You're lucky to have a cold," he told Skip.

"I don't feel lucky," Skip said as he splashed.

"We have to get out," Vikki looked at the top of the vat, high above. "Any ideas?"

"There's only one way we'll get out of here, Vikki," Skip said. "HELP!" he yelled.

"Who's there?" said a voice outside the vat.

"We're in the Yummies vat! We need help!"

"Keep swimming. I'll be right there!" Rose Parker appeared over the side of the vat. She threw a rope down. "Can you climb?"

Later, they were outside the vat, dripping on the floor. "Lucky thing you were here, Ms. Parker," Vikki said. "But why were you here?"

"I was leaving," Rose pointed to a box on the floor. "I stopped by to pick up a few things."

"Maybe you wanted to ruin one last shipment of Yummies?" Skip suggested.

"What?" Rose said.

"We're investigating Yummies," Vikki said. "They smell like old socks and horse sweat."

"My hall of flops!" Rose went through her box, pulling out two bottles of clear liquid.

An Important Clue

Vikki opened them and sniffed. "Colorless and odorless. What does that sound like?"

"Water?" Rose said.

"Somebody switched bottles on you. Who knows about your hall of flops?" Ricardo asked.

"Everybody in the company," Rose said.

"So anyone could have done it," Skip said.

"They're concentrates," Rose said. "You could use a needle to squirt a little into a box."

"But every box is affected," Vikki said.

Rose thought for a moment. "That means my chemicals have to go in during processing."

"Couldn't somebody dump them in the vats?"

"No, Skip. The Yummies would smell like socks or whatever right away," Ricardo said.

"It has to happen after the Yummies are made, but before they go to the warehouse. How about when the Yummies go into their boxes?" Vikki headed for the boxing room. "Let's get a look at that Robox packing machine."

Inside, the Robox chugged away, swallowing cardboard and Yummies and turning out finished boxes. "It's awfully big," Rose said.

"Has to be," said Skip. "There's a printing press, an ink drier and a folding machine in there to make the boxes before the Yummies go in." He looked around the outside of the machine. "Where is the door to let repair people inside?" He found a panel off to the side. "Okay. I'm going in to check this thing out."

Moments later, Skip reappeared. "Nothing funny with the printing press. Could it be the drier?"

"The hot air would ruin my chemicals," Rose said. "They would dry up or break down."

Skip stood where the Yummies boxes rolled from the machine. He picked one up. "Wish I could smell." He touched the box. "How can this be damp if it just went through the ink drier?" He gave it to Ricardo. "Smell this."

Ricardo sniffed. "Nothing."

Rose took the box. "Let an expert try." She inhaled slowly over the box. "Ink, Yummies... and something else." She took another deep breath. "Old socks, very faint, but left in a hot warehouse, it would get nice and ripe."

"How did you do that?" Ricardo asked.

"They don't call me Rose the Nose for nothing, buster."

Skip went back into the machine. When he came out, he had a flat box in his hand.

"Between the ink drier and the cardboard folder is a sprayer. It wets down the cardboard to make it easier to fold. I held this cardboard under the spray for several squirts. Take a whiff."

They all sniffed. "Old socks," Skip said. "Even I'm catching it." He grinned. "Now we know who's behind this. It's Mr. Grell's machine, and he doesn't want Yummies going out to people."

A Likely Suspect

"Nice try, but it doesn't tie up all the facts," Vikki said. "Why would he steal Rose's chemicals? How does he get them into the machine?" She turned to Rose. "Who gets supplies for the Robox?"

"The Robox is Leazy's baby, but he wouldn't get the supplies. His assistant probably does it."

"You mean Rip Offenback?" Vikki said.

"Sure. He was around here earlier tonight, helping me pack. Sneezed his head off." Rose looked at Skip. "I think he caught your cold."

"Just got over a cold, too, didn't he?" Vikki said.

"Yes. I remember, Leazy was nearly out of his mind. That batch of Yummies was the worst ever. Smelled like horses..." She stopped.

"The bottles you took were identical," Vikki said. "One was old socks. And the other?"

"My horsey-smelling room freshener," Rose said.

If someone couldn't smell the difference between those two bottles..." Skip began.

"They wouldn't be able to tell them apart!" Ricardo finished. "But we don't have any real proof. How can we make it stick?"

"I have an idea," Vikki said, turning to Skip. "How is the sprayer set up?"

"It's over one of those moving belts. I guess the smelly stuff is in the tank over it."

"Could you make the tank squirt anyone who tries to move it?"

Skip nodded. "It wouldn't be too hard."

Vikki smiled. "Then here's the plan..."

The next morning, the Gang was back in Leazy's office, with Rip Offenback. "Mr. Offenback, we're detectives," Vikki said. "We think we know how the Yummies are being ruined, ➡"

but we need to see the Robox," Vikki said.

"It'll take a while to shut it down," Offenback said. "Ah-choo!" He gave Skip a dirty look.

"That's okay. We also have some suspects coming over," Vikki said. "Would you show them in?" Offenback left the office, returning with J. Pierpont Grell and Rose Parker. Ricardo snapped a picture with his instant camera. "Just for our records," he said.

"Got to get to that machine." Offenback left. Leazy stared at the two people he had fought with the day before.

"What's the meaning of this?" Grell burst out. "How dare you accuse me of ruining your products?"

"It's a product of your company that interests us," Vikki said. "Did you know Mr. Leazy is using a Robox to package his Yummies?"

"Egad! My own machine!" Grell said.

The Scene of the Crime

Leazy's phone rang. "What is it?" he barked into the receiver. Then he put the phone down. "That was Offenback. The machine is stopped."

They went to the Robox room. "This is where the Yummies could be ruined," Vikki explained.

"Maybe the cardboard sprayer..." Grell said.

Leazy turned on him. "You and your machine are trying to destroy me! I'll get you for this!"

Vikki cut in before Grell shouted back. "Gentlemen, please. There are more questions to ask. Who gets the supplies for the Robox, Mr. Leazy?"

"Offenback," Leazy replied. "I'll call him."

Offenback appeared quickly. "Yes, chief?"

"My, Mr. Offenback," Vikki said. "Your shirt looks as fresh as if you just put it on."

"Er...thank you," Offenback said.

"That's because you *did* just put it on," Vikki said. "You had a blue shirt and a striped tie on when you brought Mr. Grell and Ms. Parker into the office. So why are you now in a white shirt?"

Offenback began coughing and sneezing.

"Here's the picture I took of you in Mr. Leazy's office," Ricardo added.

Offenback silently stared at the photo.

"We also know why you had to change. I loosened the tank over the sprayer in the ma-

chine. That's why you got squirted," Skip said.

"I was just checking inside. This smelly stuff sprayed all over me." Offenback said.

"It should have been smelly," Vikki said. "If that was the tank you left there. But we got rid of that tank last night. You were sprayed with water. With your cold, you couldn't tell. You thought you smelled like old socks."

"Er...uh..." Offenback said.

"You ruined the Yummies to get revenge on Mr. Leazy for shooting down your snack food. You also hoped to get his job," Vikki said.

Offenback just hung his head.

As they led Offenback away, Ricardo asked, "But what about the falling walkway?"

"He set it to fall apart during the night, to ruin the vats of snacks. It would really look like the work of the fired workers," Vikki said.

"How can I thank you?" Leazy said. "I know—a bonus—how about all the Yummies you can eat?"

The Gang looked at him. "Thanks, but no thanks," Vikki said. "I can't look at a Yummie without thinking of that gray glop."

"Maybe you'd like to join G.A.G.," Grell said.

"Thanks," said Skip. "But right now, we're just glad to come through the Case of the Private Nose—with our noses clean."

**Next month begins a
brand new adventure,
starring the
Bloodhound Gang!**





Gasp!

A CONTACT QUIZ

by Megan Stine
and H. William Stine

Breathe easy—because here's a true-or-false quiz on something you know all about—breathing! Or do you know all of the strange ways animals must breathe to survive? Just take a deep breath and you'll survive these eight questions of life and breath!

1. Earthworms breathe through their skins.

True or False?

2. Llamas can breathe better on a mountaintop than people can.

True or False?

3. Birds need more oxygen than most animals.

True or False?

4. The sperm whale can hold its breath longer than any other mammal.

True or False?

5. When bears hibernate, they stop breathing completely.

True or False?

6. Spiders cannot live or breathe underwater.

True or False?

7. Grown-up frogs use both lungs and gills to breathe.

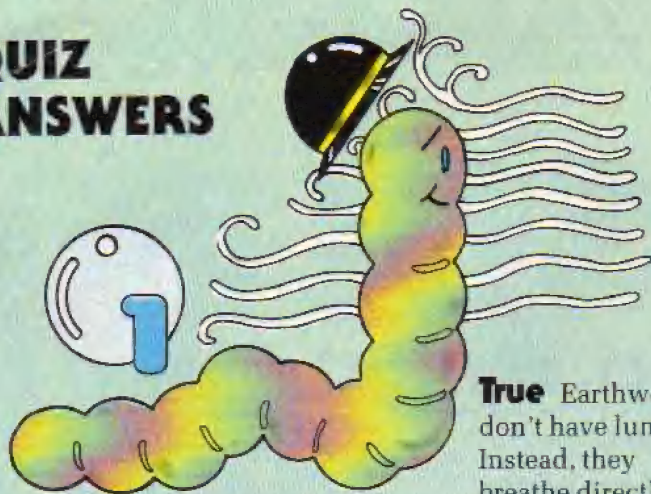
True or False?

8. There is a kind of fish that can live out of the water.

True or False?

To find the breathtaking answers, turn the page.

QUIZ ANSWERS



True Earthworms don't have lungs. Instead, they breathe directly

through their *skin*! Air passes through their thin skin. The oxygen goes right into a worm's bloodstream. This system works fine even underground, because there is air in the spaces between the dirt—until it rains. Then rain soaks the ground, filling up air spaces in the mud. So when it rains, worms come out of the ground to survive.



2 True The air at the top of a mountain is thinner than at sea level. Thinner air means less oxygen. If you think that makes it hard to breathe, you're right. But llamas are prepared for the high life. Their blood absorbs oxygen faster and better than people's blood can. So they're breathing easy while you're huffing and puffing away. It's a good thing llamas have adapted to mountaintop air. After all, that's where they live!

3

True Birds need more oxygen because they use up oxygen

faster than most animals. (If you flap your arms for 15 minutes, you'll see how tiring flying can be.) Besides their two lungs, birds also have four huge air sacs. When a bird breathes in, some of the air goes into the lungs and the rest of the air fills the sacs. When the bird breathes out, the air from the sacs passes through the lungs again and more oxygen is absorbed. So, in a way, birds are taking two breaths for every one.



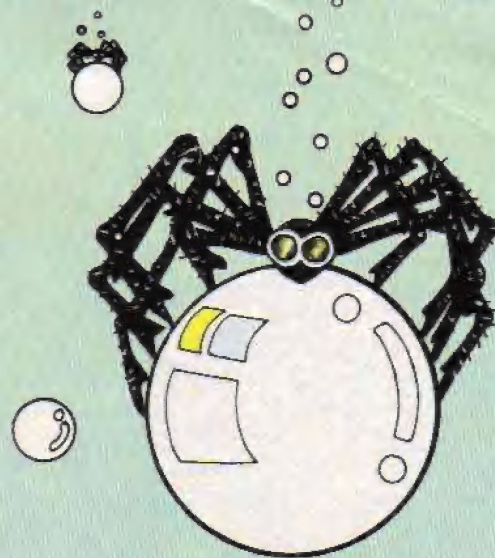
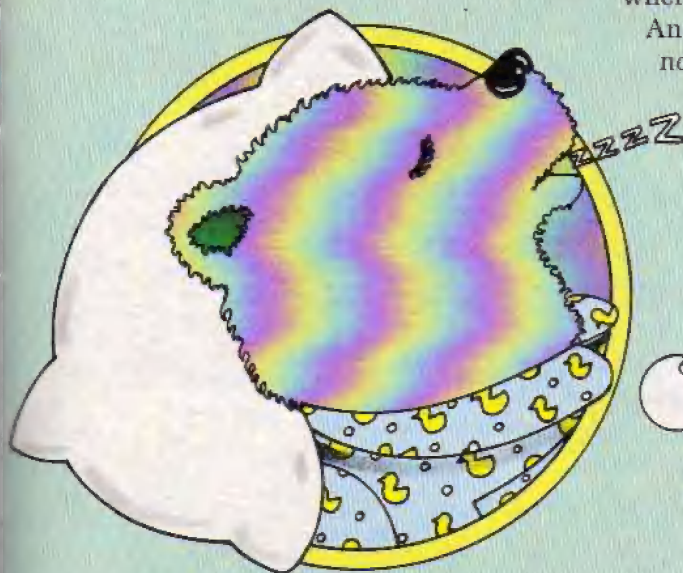
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True The sperm whale is the world's underwater breathing champ. It can dive down a mile (1.6 km). And it can stay underwater for over an hour on just one breath! Like all mammals, a whale has lungs for holding air. But, instead of a nose, it has a blowhole, a hole on top of its head. Whales take in air through their blowholes, not through their mouths. There are no reports on how whales deal with sneezes!



5 False No, the scientific term for a bear which has stopped breathing is "dead bear," not "hibernating bear." But sometimes it is hard to tell the difference. Hibernation is a deep, deep sleep. During it, the animal's breathing—and heartbeat—slow down so much they can hardly be detected. In this slow-motion state, bears need less oxygen and less food. It's a great way to get through the winter when food is so scarce.

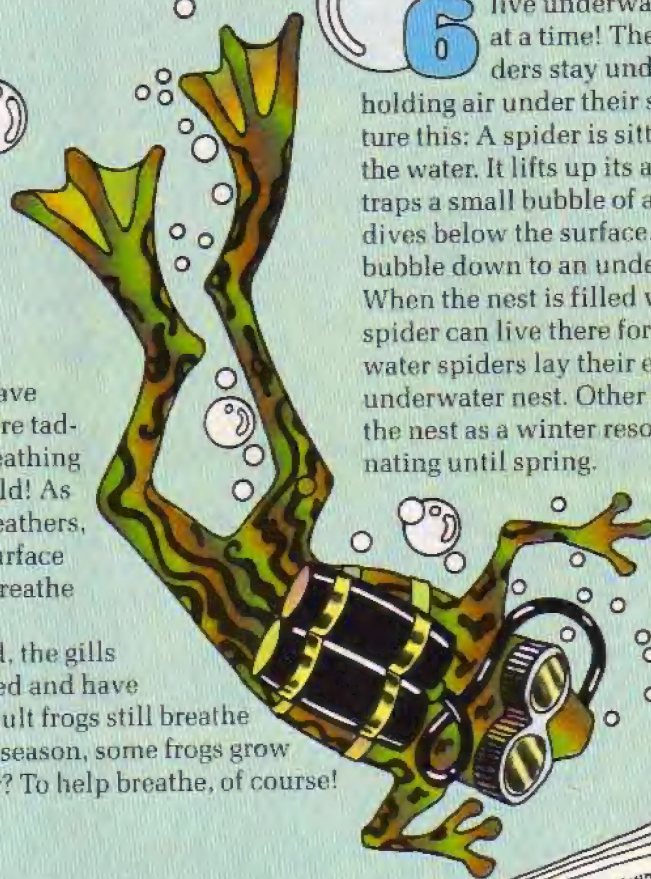
And it's one case when not breathing much is the best way to survive.



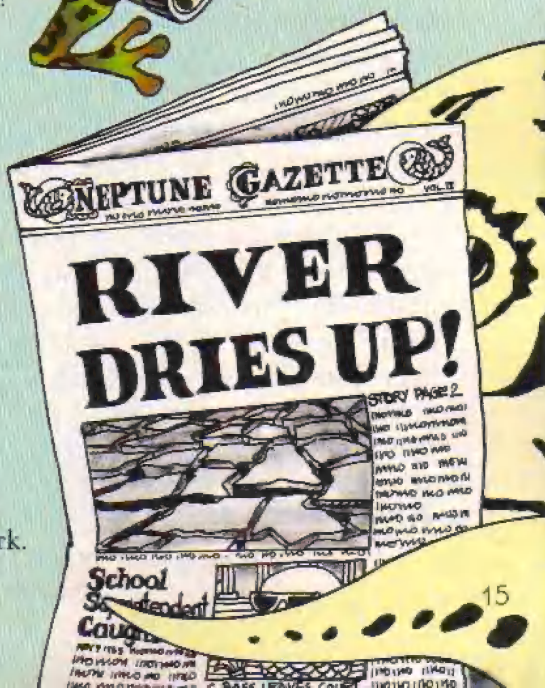
6 False Some spiders can live underwater for weeks at a time! These water spiders stay underwater by holding air under their stomachs. Picture this: A spider is sitting on top of the water. It lifts up its abdomen and traps a small bubble of air. Then it dives below the surface, taking the air bubble down to an underwater nest. When the nest is filled with air, the spider can live there for a while. Some water spiders lay their eggs in this underwater nest. Other spiders use the nest as a winter resort—for hibernating until spring.

7 False Full-grown frogs don't have gills anymore. But when they were tadpoles they used every kind of breathing system known to the animal world! As tiny tadpoles, they were underwater gill breathers, like fish. Later they started coming to the surface for an extra mouthful of air. Tadpoles also breathe through their skins and even their tails.

By the time a young frog climbs onto land, the gills have disappeared. The lungs have developed and have taken over most of the breathing job. But adult frogs still breathe through their skin, too. And during mating season, some frogs grow fuzzy hairlike things on their legs. What for? To help breathe, of course!



8 True The lungfish can live out of the water. Now don't get us wrong. Lungfish have never packed a bag and stayed in a motel. But these fish can live for months in dried-up old mud. Lungfish have gills, like all fish. But, as the name says, they also have lungs. When the swamps they live in dry up, the lungfish are still okay. They just come up out of the mud for a breath about every 20 minutes. When the mud dries out, the lungfish go into a deep summer sleep. When the fall rains come, the lungfish wake up and their gills go back to work.



ANIMAL COPYCATS

by Lisa Hsia



What do you do when a bee buzzes around you? Freeze—and hope it goes away, right? No one wants to get stung. That includes animals looking for food. So they avoid the honeybee. After all, it's hard to enjoy a meal after it just gave you a nasty sting.

A sneaky insect called the hover fly uses this fear of being stung to its advantage. The hover fly's secret is that it looks just like a honeybee. The joke is that the hover fly doesn't really have a stinger. In fact, to most animals, it's harmless. The hover fly is safe from attack by other animals because it is disguised to look like a bee.

How does the hover fly repay its debt to the honeybees? It eats them! Honeybees don't get alarmed when a hover fly comes near. They think it's one of them. But when the hover fly gets close enough, it will bite a bee. Its bite paralyzes the bee's body. Soon, the hover fly eats the bee and looks for another meal.

Animal Impostors

There's a name for the hover fly's look-alike

Above: One of these insects isn't a bee. On the right is a hover fly. Hover flies don't just look like bees. They act like them, too. They suck nectar from flowers, and even buzz.

trick. It's called *mimicry*. Lots of animals use mimicry. They imitate the shape, colors or habits of dangerous or bad-tasting animals. The world of nature is harsh—whole groups of animals can die off. To avoid that, it's a good idea to copy animals who have strong weapons of defense. Just looking dangerous helps your odds of surviving.

Think of the many different kinds of flies. Some look like common houseflies. Others, like the hover fly, don't. Because the hover fly has a greater chance of being mistaken for a bee, it's often avoided. So more hover flies are likely to survive over a long period of time.

How do animals become mimics of other animals? Scientists aren't completely sure. They do know that animals adapt and change. Traits are passed from parent animals to their children.

This sort of change can't take place in one generation. Adaptation is a long, slow process. But after millions of years, some remarkable things can happen.

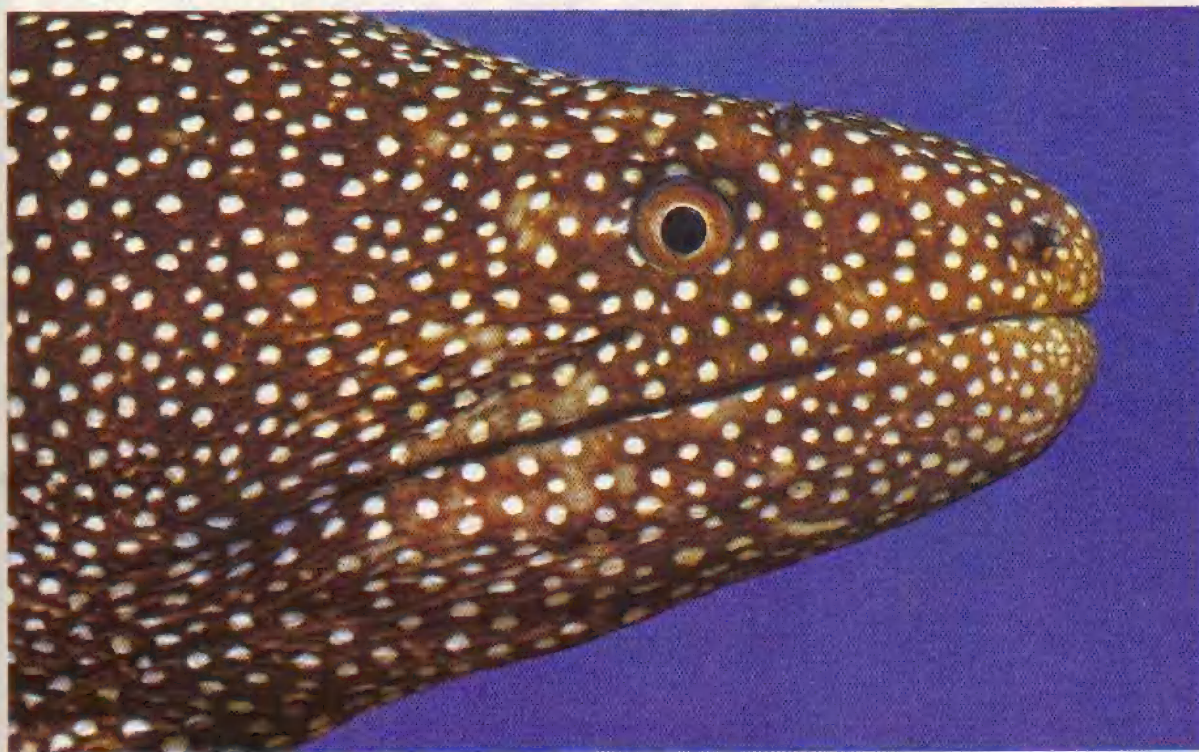
Dig Eyes

A bird approaches a moth looking for a meal. Sensing danger, the moth flashes its wings open to reveal two large circles that look like eyes. Startled by the size of the eyespots, the bird is afraid that it has met one of its own enemies,

like a cat or an owl. The bird flies away.

This is a bluff many insects and fish use to protect themselves. They have eyespots which make them look more threatening to their enemies.

The white-spotted moray eel of Hawaii is a deadly animal with sharp teeth feared by most of the creatures in the sea. There is a fascinating fish called the *plesiopid* (PLEE-zee-OP-id). It mimics the eel in a most unusual way. When the plesiopid senses danger, this fish pops ➡



Left: On top is the head of the feared moray eel. Underneath is the tail of the plesiopid fish. The eye spot and similar colors make the plesiopid's tail look like the moray's head. So creatures that fear the moray are tricked into staying away from the plesiopid fish, too.



Right: For birds the viceroy butterfly (right) is a tasty meal. The monarch (left) isn't, so birds avoid it. By copying the monarch's colors, many viceroys escape from being eaten.



headfirst into the nearest hiding spot. Leaving just its tail showing, it expands its back fins. This reveals an eyespot that looks very similar to the eye of the moray eel. The plesiopid fish and the moray eel have the same brown body with white spots. So the plesiopid fish fools its enemies into thinking its tail is the head of the eel!

Look-Alikes

One of the best-known mimics is the viceroy butterfly. Although slightly smaller in size than the monarch butterfly, it has orange and brown wings that are almost exact copies of the monarch's.

Why is the monarch butterfly a good insect to imitate? Birds and other animals have learned from experience that these brightly-colored butterflies have a terrible taste.

Adult monarchs lay their eggs in poisonous milkweed plants. The larvae that hatch feed on the plants as they grow, giving them a bitter flavor. Once an animal gets sick from eating a monarch, it is unlikely to try one ever again.

The viceroy butterfly, on the other hand, tastes fine. Birds generally mistake it for a monarch, however, and avoid it.

The name monarch means "king." Viceroy means "to take the place of a king." That's exactly what the viceroy butterfly pretends to do. The brightly-colored wings of the monarch

and the viceroy both seem to be an effective warning signal to other animals not to touch.

Another animal that uses color as a warning is the poisonous coral snake. Bright red and yellow rings circle its body, telling other animals: "Danger! Keep away!"

While the Southeast Asian coral snake is poisonous, its many imitators are not. The milk snake is also ringed with bright circles of red, yellow and black, but it is harmless. Although the patterns are not identical, it is difficult to see the difference while the snake is moving quickly through the grass. Hungry predators avoid both kinds of snakes. Better safe than sorry.

More Mimics

Some animals go even further. When an enemy attacks, it usually goes for the head of its prey. Animals can survive the loss of a leg or part of a wing, but never the loss of a head. To fool attackers, some butterflies have developed false heads. They look like the real thing, complete with antennae. But they grow at the wrong end of their bodies.

If there is an ultimate mimicry award, it could go to a coral fish called the *saber-tooth blenny*. It survives by imitating not only the looks, but also the movements of the cleaner wrasse fish.

The cleaner wrasse is a narrow fish with blue and black scales. It serves an important function

—saving other fish from the parasites that grow on their bodies. How? It eats the parasites. Fish identify the cleaner wrasse by the wiggling of its body as it approaches, and are not alarmed.

The blenny is also a blue and black narrow fish. It makes the same wiggling dance as it comes near. The difference is that, instead of gently cleaning the fish, it grabs a bite of flesh for a meal and darts away!

You've just seen several animal impostors and the ways they use disguises to fool their predators and victims. People sometimes like to masquerade as something else, too—at a costume party, for instance. They do it for fun. But animals use mimicry for a serious purpose...their own survival.



Above:

Animals can live after losing some parts—but not their heads. That's why this hairstreak butterfly looks like it has a head on each end. If an enemy takes a bite out of the fake head on the left, the butterfly will survive.

Left: Here's a fish whose copycat ways help it eat. The wrasse (top) gets close to other fish to clean them. The blenny (bottom) looks like the wrasse. So other fish let it get close, too. But the blenny doesn't clean the fish. It takes a bite and swims away.

HICKS LOOKING AT YOU

A moth's eye spots
fool its enemies to scare
them away. Can they
fool you? Which are
eye spots and which
are real owl eyes?
Answers on page 37.



Any Questions?

by Mary Tota

What is a wart? No, it's not a bump you get from touching a toad. Warts are infections on the skin that are caused by viruses.

The layers of your skin are made up of tiny cells. Sometimes a wart-causing virus attacks the cells at the skin's surface. The infected skin soon forms layers. This growth is a wart. The virus lives inside it.

You may not get warts from toads, but you can get them from someone who has warts. When a wart is scratched open, the virus can spread if it touches another part of the body or another person.

But don't worry. If you get a wart your body may fight the infection and the wart will go away on its own. What if a wart doesn't go away on its own? Some people put vitamin E oil on it. And if that doesn't work, a doctor can always remove it.

Question sent in by Shea McManus, Sutton Bay, MI.



How are balloons made?

Believe it or not, balloons start out in rubber trees in Asia. The balloons are made of liquid rubber, or *latex*, from the sap of the rubber trees. In the factory, forms in the shapes of balloons are dipped into the latex. This "dip method" is how balloons are made.

Before the forms go into the latex they are coated with a type of salt. The salt helps the thin layer of latex to thicken. After the dipping, the rubber-coated forms are put into hot water baths to remove these salts.

Then a machine adds the rings at the mouths of the balloons. These rings make it possible to blow up the balloons. Next, the balloons are baked for 20 minutes. This process makes the balloons elastic. Without being baked, the balloons would be just like bubble gum. You could stretch them out but they wouldn't bounce back.

After cooling down, the balloons are done. Some are blown up so things like "Happy Birthday" can be printed on them. Now the balloons are ready for a big party!

Question sent in by Kim Hamilton, P.H. Meadows, B.C., Canada.

Do you have a question that no one seems able to answer? Why not ask us? Send your question, along with your name, address, and age, to:

Any Questions?
3-2-1 CONTACT
P.O. Box 599
Ridgefield, NJ 07657

Why are stars the same size?

Starlight, star bright, the first star I see tonight... looks just like the second one and the third. Have you ever wondered why stars all look to be the same size?

Actually, all stars are not the same size. So far, four different star sizes have been named. There are dwarf stars, medium stars, giant stars and supergiant stars. Stars can range from being 1,000 times smaller to 1,000 times larger than the sun.

The reason most stars look the same size is they are so far away from the earth. From all the way out in space, they appear to be just tiny specks of light. The size differences between these tiny specks are very small and very hard to see. It's the great distance that fools your eyes.

Question sent in by Kim Hamann, Albany, NY.



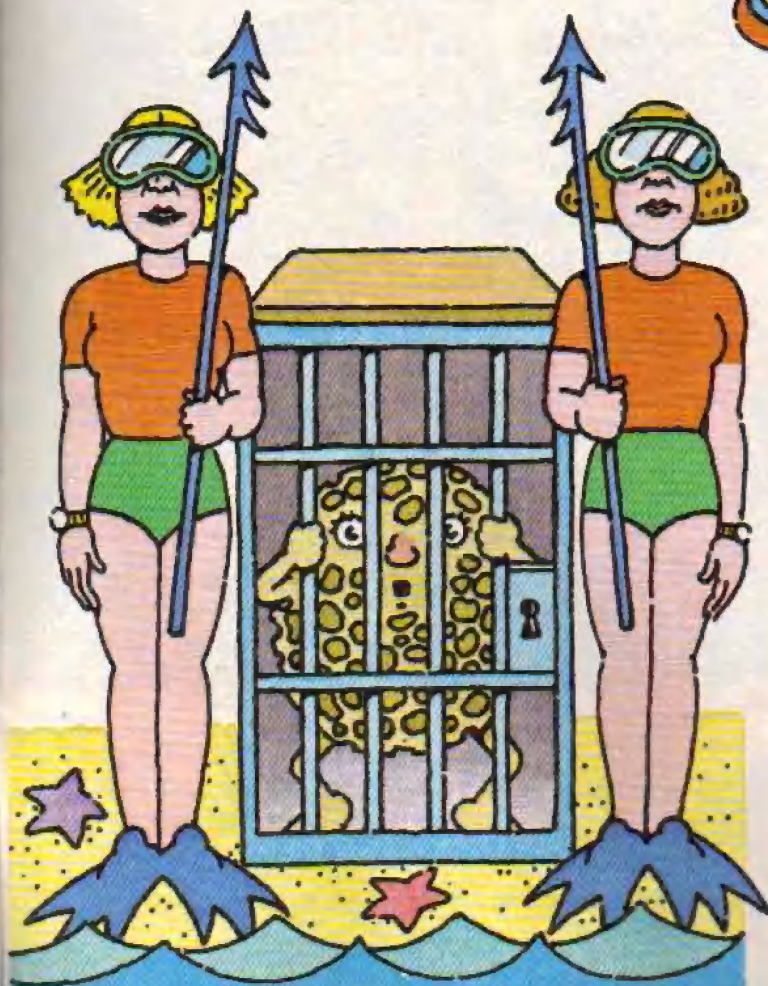
Where do sponges come from?

There are two types of sponges. Most that are sold in stores are factory-made. But before sponges could be manufactured, people used sponges that came from the ocean. And sometimes they're still used.

Sponge animals are found motionless at the bottoms of oceans and lakes all over the world. In many places, like the Mediterranean Sea, people dive in deep waters for the sponges. But in Florida, people fish for sponges in glass bottom boats that let them see the ocean floor. In shallow water, they hook the sponges with long poles.

After the sponges are caught, they are kept in pens along the shore. Water fills these pens at high tide and removes the sponges' flesh. Soon, just the skeleton of the animal is left. That skeleton is the sponge that cleans up all the messes you get into.

Question sent in by Christianne Hillery, Lower Burnell, PA.



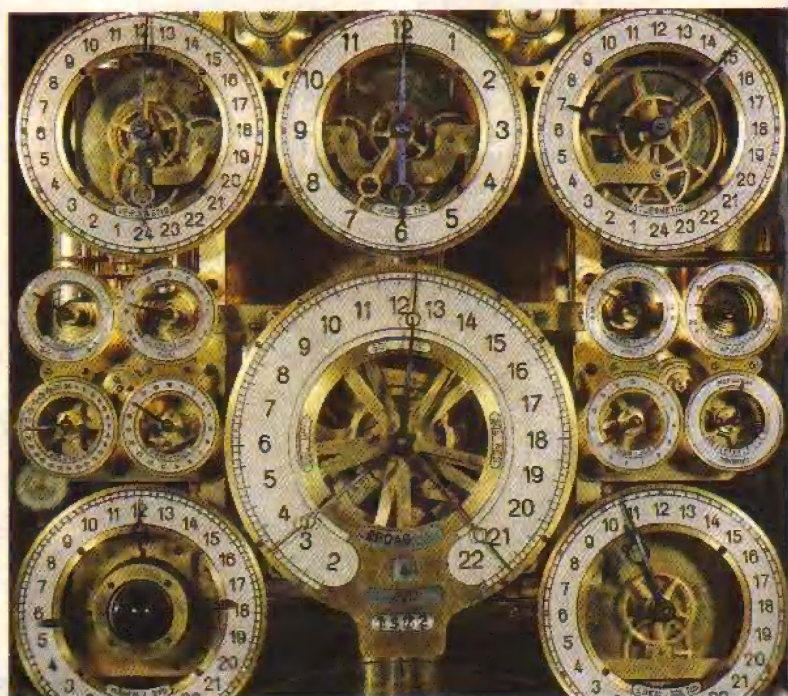
Contact Report

Astro Clock Not all clocks measure the time of day. Astronomical clocks measure things like the moon's phases, or time earth's orbit of the sun. It takes a special clock to keep it all straight. Astro-nomical Clock #4 is one that can.

One reason is that the clock adjusts for the uneven year. A year has $365\frac{1}{4}$ days. Every fourth year the quarters make an extra day. That's why February has 29 days this year. It's leap year. But in some years an extra day isn't added. There was no leap year in 1900. But there *will* be one in 2000. Confusing? Not for this clock. It knows when to add days and when to leave things alone.

There are many computer clocks that can do this. But this clock runs by weights and gears. "That's what makes it fantastic," says William Andrewes of The Time Museum, where the clock is kept. It's the world's most complicated clock.

—Written by Mary O'Connell



This clock can tell which years are leap years.

Cow Earrings Cows with earrings? For millions of cows it's the latest in ear gear. But they aren't wearing jewelry. They are wearing special ear tags that contain a chemical for killing insect pests.

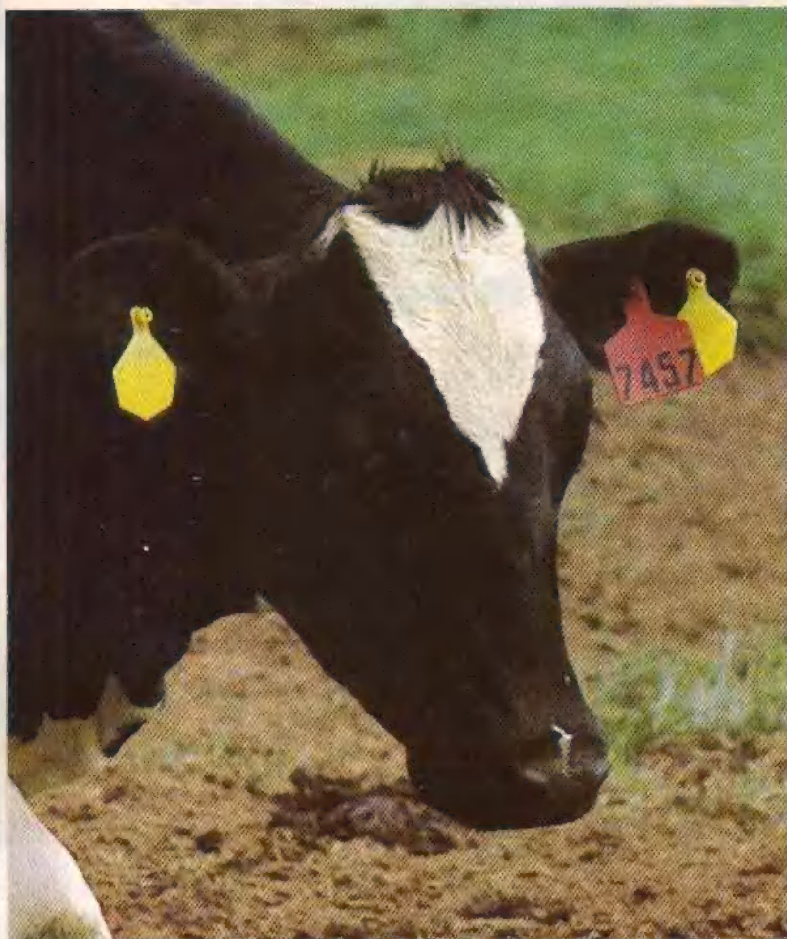
The tags are stapled into the cow's ears in much the same way that people have their ears pierced. When the cow moves its head, the insecticide spreads out onto the hair of its face, ears and back. So instead of biting the cows, the bugs bite the poison dust.

"It seems that these earrings work better than any other method," says Richard Miller of the U.S. Department of Agriculture. Before, cows sometimes had to get daily dustings to keep down bugs. The earrings last all summer long.

Right now, cows all over the country are wearing the tags. They are simple to attach. And once they're in place, the insects won't bug the cows at all.

—Written by Michele Lyons

Idea for this story sent in by Kathleen Kramer,
Alliance, OH.



Now cows wear earrings that kill bugs.

Contact Report

What a Mouthful! When Cliff Gander saw something sticking out of a sand bar in Missouri's North River, he knew what it was right away. He has been hunting and studying fossils and artifacts all his life.

It was the tooth of a mammoth. That's a kind of elephant that lived in North America over 10,000 years ago. There have been other mammoth tooth remains found in Missouri. But few have been in as good condition as Gander's 1983 find. Most of the tooth's roots are unbroken. Some even have pieces of bone still in between.

The tooth itself is huge. It is eight by three and three quarters inches on top and seven inches deep—bigger than a brick. Now that's a mammoth tooth!

—Written by Nellie Ann Lanham



This mammoth tooth was found in a Missouri river.

Super Prints A new fingerprinting kit that uses Super Glue is helping police catch criminals.

The fingerprinting kit comes with pads that give off a chemical gas and Super Glue. The pads are put in a box with the object to be tested. Chemicals in the glue and the gas react with human sweat to form prints. So, wherever human hands have touched the object, thin, crystal-like molds of fingerprints appear.

Super Glue's super fingerprinting power was found by accident. Some people were gluing aquariums together. The strange prints kept showing up where they touched the glass. People at Dura-Print, the company that makes the kits, thought it would be great for police. So far, hundreds of police departments are using it.

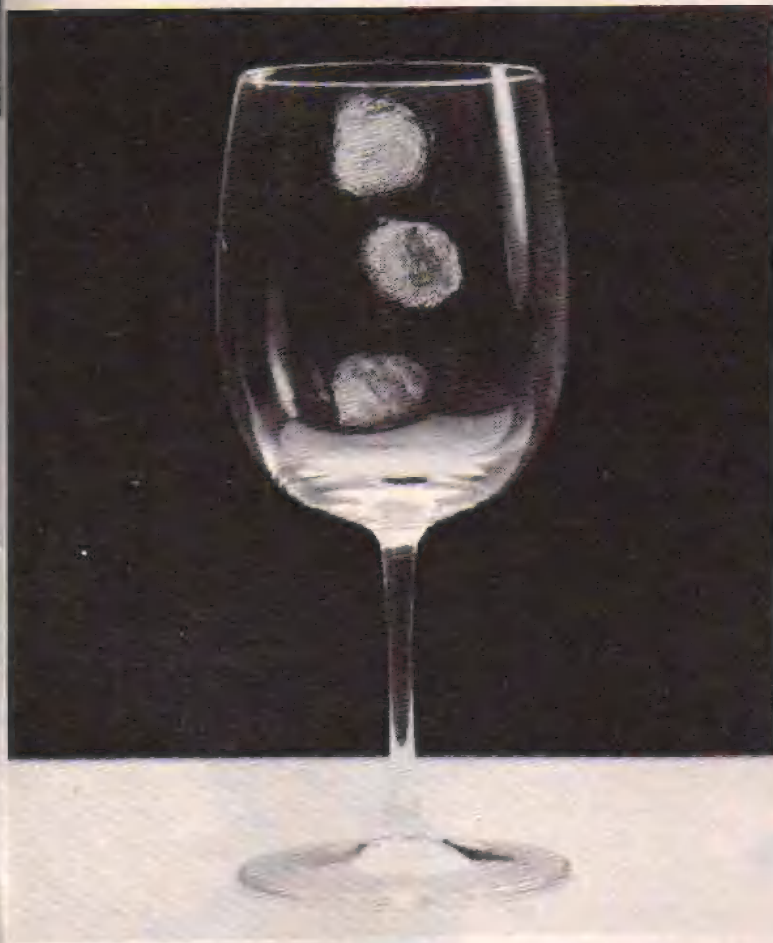
—Written by Michele Lyons

What's That? Have you read about a kid who invented something new? Or one who set a new science record? Then cut out the story and send it to us. If we use it, you'll get a CONTACT T-shirt. Include your name, address, T-shirt size and the name of the publication the story came from.

Write to: **The Contact Report**

P.O. Box 599

Ridgefield, NJ 07657



Super Glue helps to make strong new fingerprints.

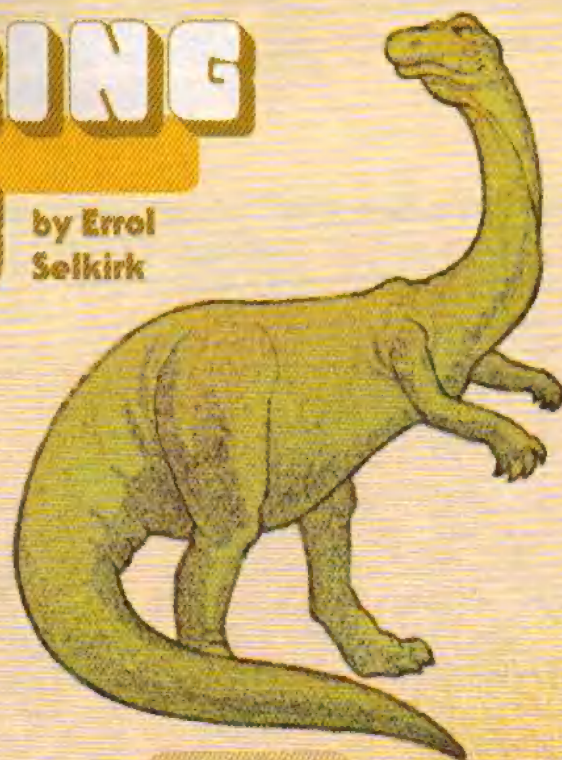
DISAPPEARING DINOSAURS

by Errol
Selkirk

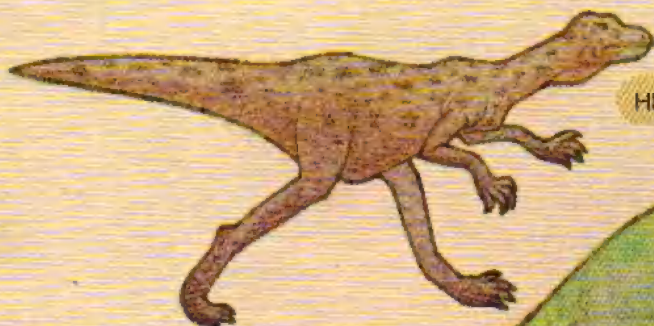
They were the biggest animals ever to walk the earth. Some were as heavy as 10 elephants and as long as a couple of buses. And if that weren't enough, many had large horns, spikes and body armor, too.

You know these animals as dinosaurs. For over a hundred million years, they ruled the earth. Then they disappeared. They have been extinct for 63 million years.

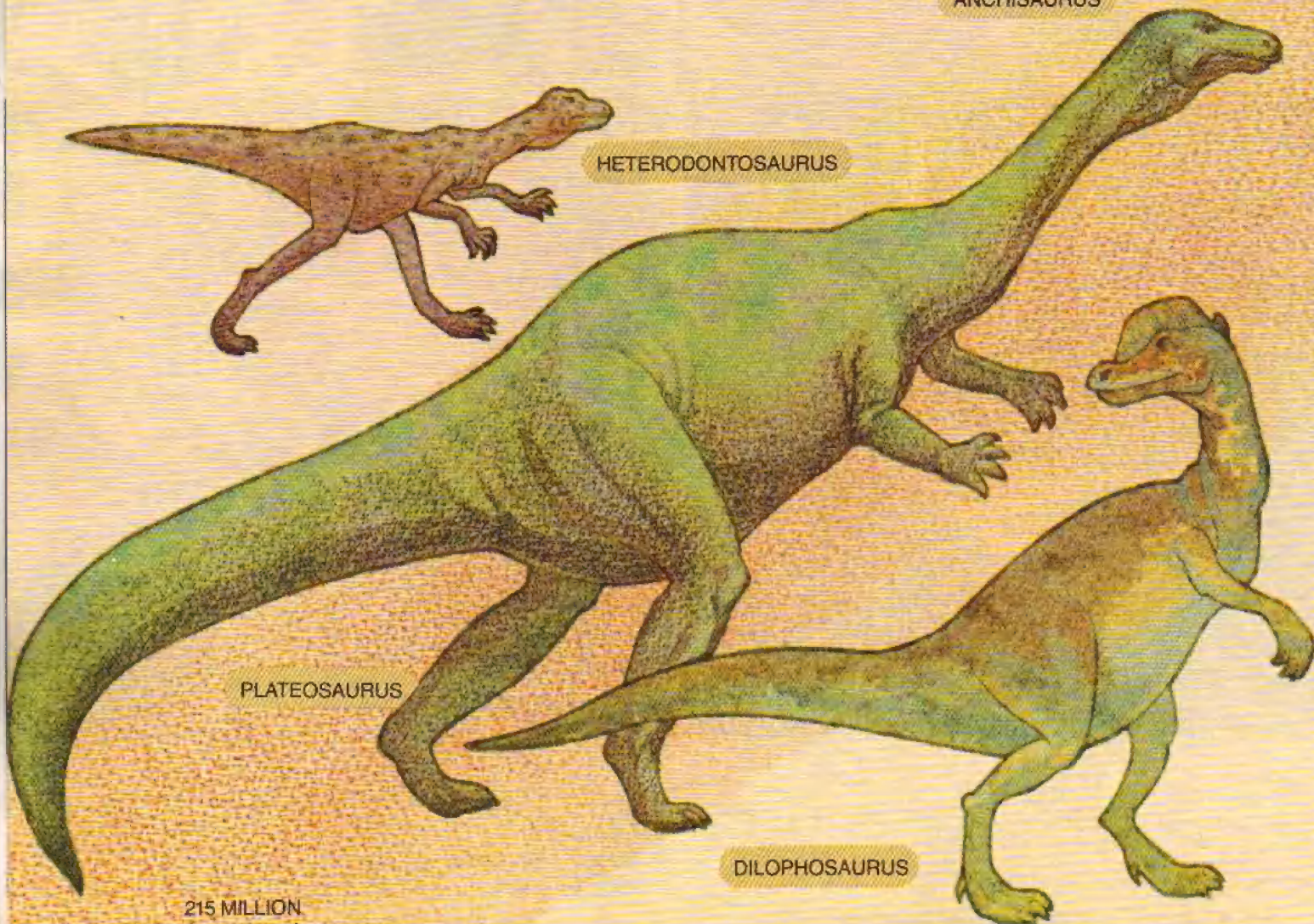
What happened to the dinosaurs? The answer to this question is still a mystery. For a century and a half, scientists have been looking for clues.



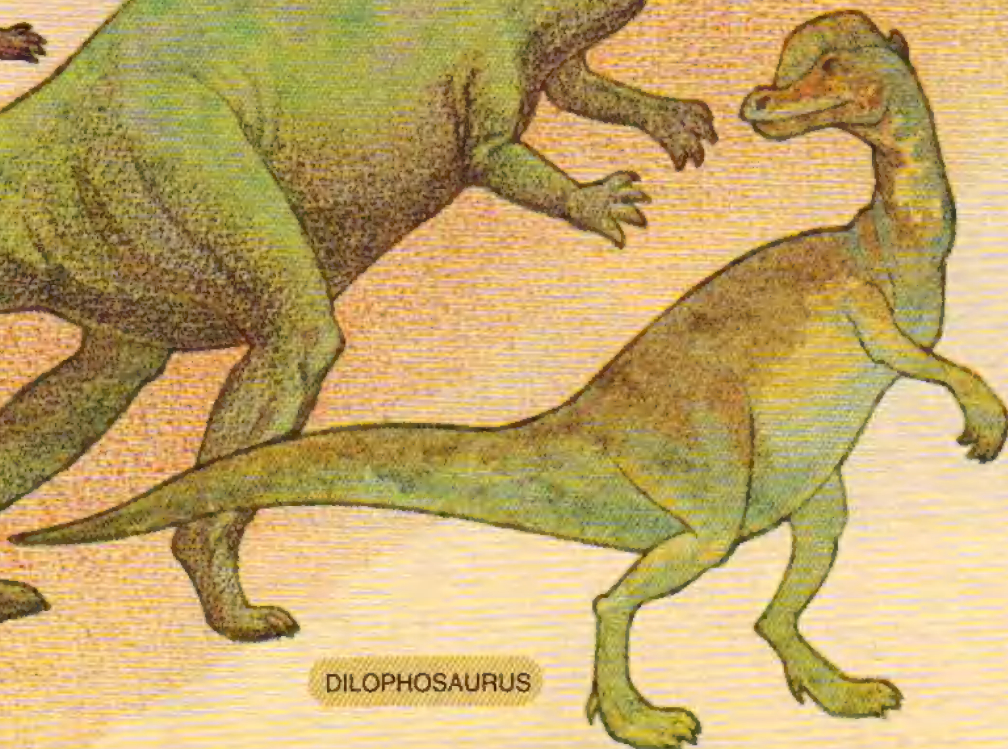
ANCHISAURUS



HETERODONTOSAURUS



PLATEOSAURUS



DILOPHOSAURUS

215 MILLION
YEARS AGO

165 MILLION
YEARS AGO

COELOPHYSIS

FABROSAURUS

TERATOSAURUS

SCELIDOSAURUS

Here are some of
the earliest dinosaurs.

mouse-like mammals that ate their eggs? At that time, no one had enough facts to say for sure.

Over the last hundred years, scientists have learned a lot about the world of the dinosaurs. By studying long buried fossils and rocks, they found that the temperature of the planet has changed over the ages. Sometimes it has gotten warmer, sometimes cooler. Oceans have risen and fallen. Mountains have pushed up from the earth in some places. Other areas have slid into the sea.

Most scientists came to believe that the dinosaurs could not adapt fast enough to these changes. So gradually, over millions of years, they became extinct. Not all scientists agreed, though. A few said that if dinosaurs could survive for 140 million years, they must have been able to adapt very well.

Many different kinds of dinosaurs had evolved over the years. Each had its special way of adapting to the world. Some dinosaurs had long necks for reaching tall plants. Other dinosaurs had sharp teeth so they could eat meat. ➡

Now one research team thinks it has made an important discovery. But other experts disagree. Is the mystery solved at last? Here are the facts. You decide.

Too Slow to Change?

In 1822, some of the first dinosaur bones were found in England. The earliest researchers knew only that the dinosaurs were big reptiles. They wanted to know how these animals lived. And just as important, they wanted to discover why they died.

Were the dinosaurs so large that they couldn't find enough to eat? Did they get wiped out by

But, despite their differences, all the dinosaurs died. So did half the plants and other animals then living on the earth. Did something terrible happen to the whole world 63 million years ago?

Pieces of a Puzzle

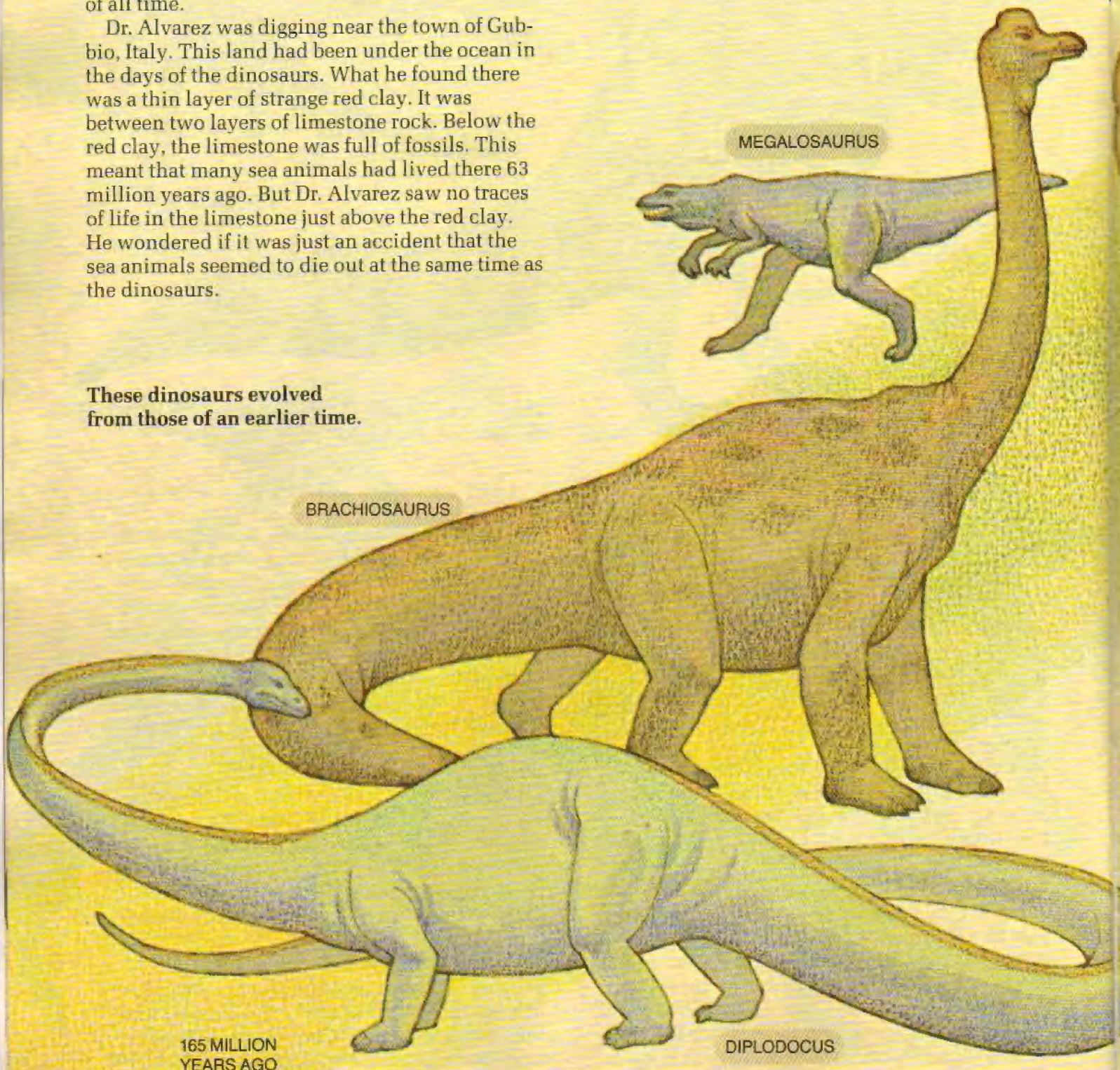
Walter Alvarez is not a detective but he does try to solve mysteries. He is a geologist who studies layers of earth and rock to learn more about their history. At work in 1979, he discovered a new clue that could point to the biggest disaster of all time.

Dr. Alvarez was digging near the town of Gubbio, Italy. This land had been under the ocean in the days of the dinosaurs. What he found there was a thin layer of strange red clay. It was between two layers of limestone rock. Below the red clay, the limestone was full of fossils. This meant that many sea animals had lived there 63 million years ago. But Dr. Alvarez saw no traces of life in the limestone just above the red clay. He wondered if it was just an accident that the sea animals seemed to die out at the same time as the dinosaurs.

The clay was checked back at his lab. It contained a rare metal called iridium (ear-ID-ee-um). There is very little iridium on earth. But there was lots of it in this red clay. Over the next year, high amounts of the metal were also found in other places around the world. All of it dated back to 63 million years ago. The question was, how did it get there?

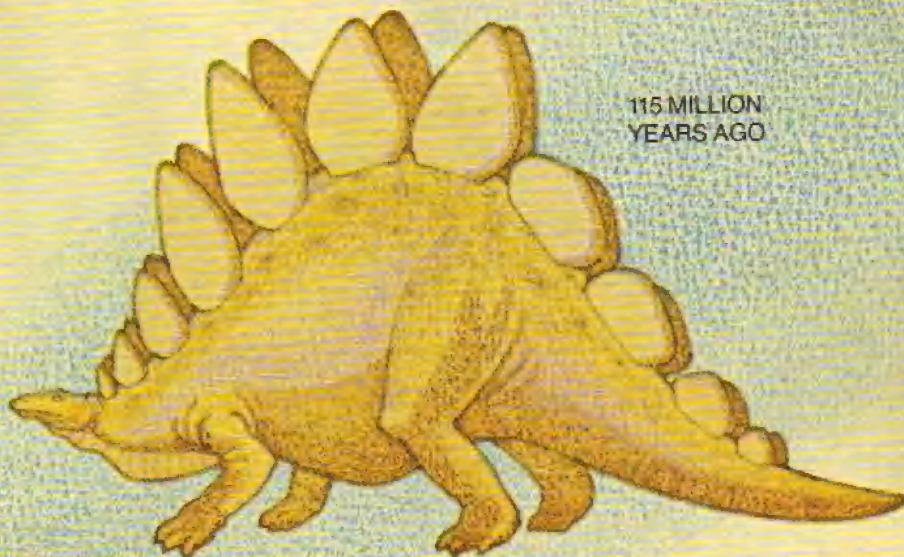
Meteors and large asteroids in space have thousands of times as much iridium as rocks on

These dinosaurs evolved from those of an earlier time.

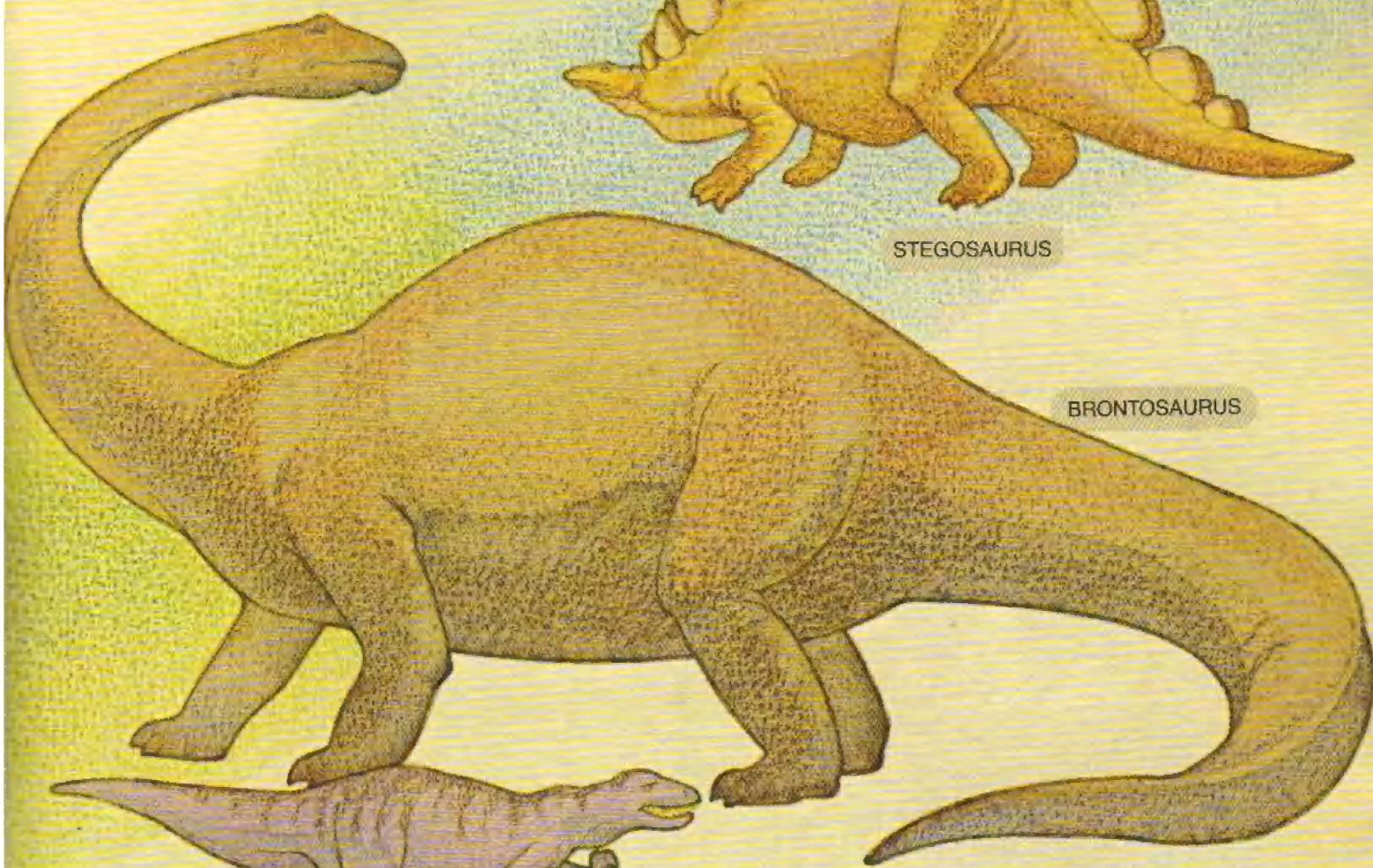


165 MILLION
YEARS AGO

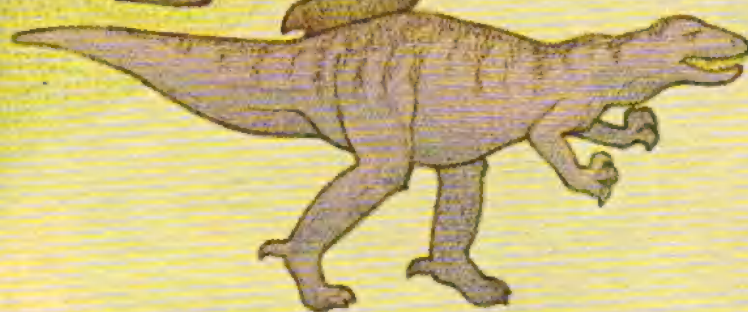
115 MILLION
YEARS AGO



STEGOSAURUS



BRONTOSAURUS



ALLOSAURUS

earth. Did a giant asteroid hit the earth long ago, Dr. Alvarez asked himself. Could this have spread iridium dust over the planet, killing many plants and animals?

Crash or Splash?

A research team from Berkeley, California, helped piece the puzzle together. From the amount of iridium found around the world, the team figured that the asteroid would have been huge. It would have weighed 500 billion tons. This asteroid would have blasted a crater in the

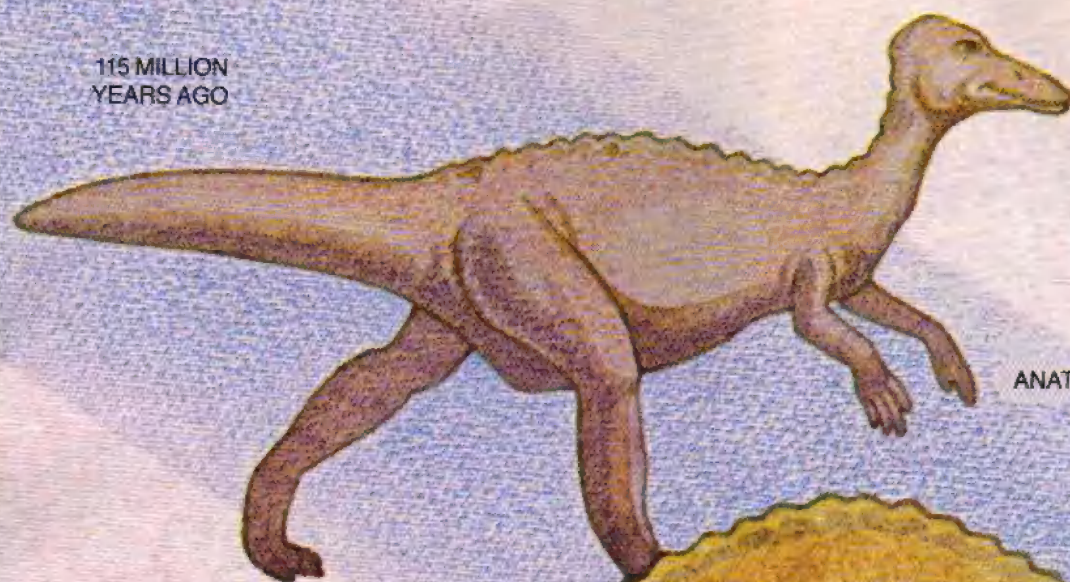
ground about as big as the state of Connecticut. Heat from the blast would have turned the asteroid into smoke and dust. A thick cloud of iridium and ash might have covered the sky around the world for months or even years.

The dust cloud would not directly destroy life. But it would block most of the sun's rays. Temperatures on land would quickly drop to freezing. Most green plants would soon die. Animals would find it hard to find food. Most of them would die, too.

But where is the proof for this theory? Is there a crater 100 miles (160 km) wide? Winds and rain might wipe away many traces, but not all. Unless the crater was underwater, that is.

Some facts suggest that an asteroid may actually have landed in the ocean near northern Europe. Researchers in Denmark found 160 ➡

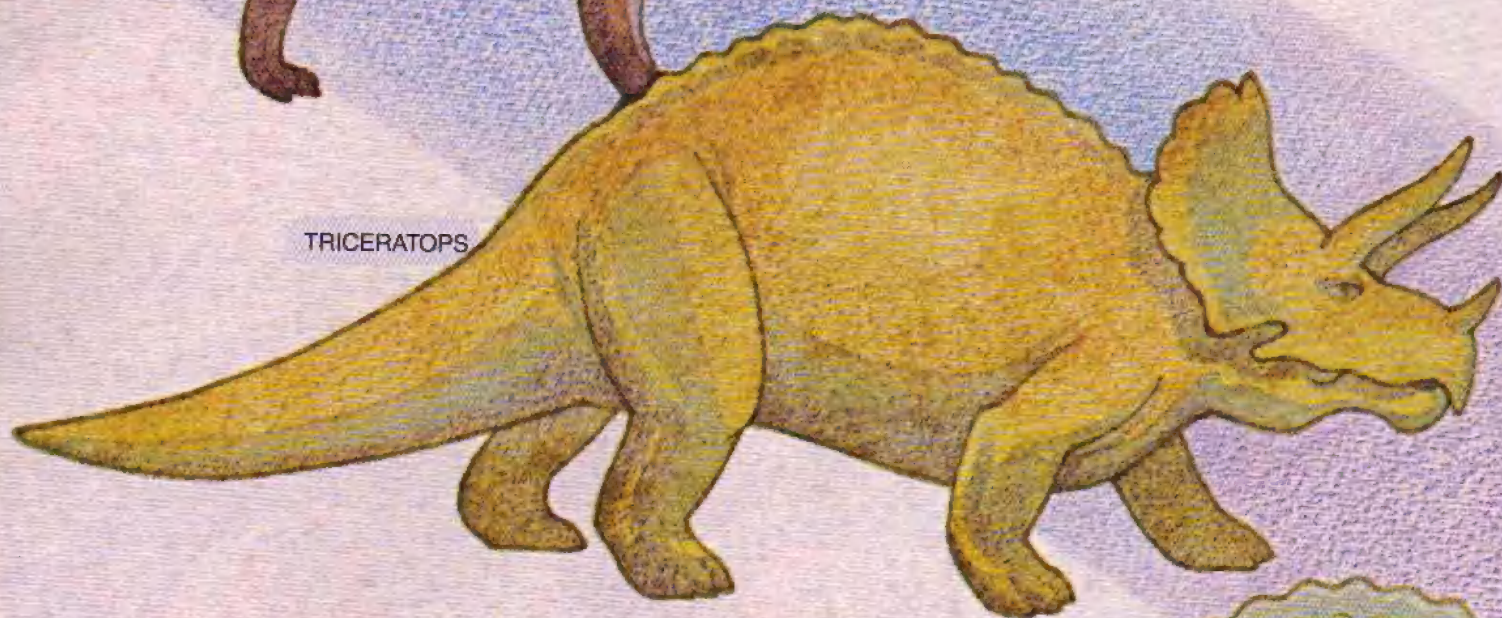
115 MILLION
YEARS AGO



These dinosaurs were among
the last to live on earth.

ANATOSAURUS

TRICERATOPS



ANKYLOSAURUS

times the normal amount of iridium there—five times higher than in Italy. And not far away in the North Sea is a round crater-like area called “Devil’s Hole.” It is more than 800 feet (243 m) deep and 150 miles (241 km) across.

“We studied an ocean impact because it is more likely, since most of the earth’s surface is water,” says another researcher, Thomas Ahrens. Dr. Ahrens used a computer to help recreate the effects of a prehistoric Big Splash.

The asteroid would have exploded against the ocean floor with the power of 10,000 atomic bombs. A blast could have filled the sky with a thick cloud of dust, ash and water vapor. It could also have sent a tidal wave into the swamps and coastal plains where most dinosaurs lived.

Other Possibilities

Other scientists wonder if the iridium clue is really so important. What if the dinosaurs were killed instead by a disaster from right here on earth? For example, huge volcanoes in India exploded long ago. Large areas were covered

with hot lava four miles (6.4 km) high. Did this make the climate of the world much warmer? Could volcanoes have filled the air with gases that turned to acid rain, poisoning the oceans and the land? This, like the other theories, still waits to be proved.

Leo Hickey, a scientist at Yale’s Peabody Museum, believes that no one theory will explain everything. Dr. Hickey studies fossils of plants that lived long ago. He believes that dinosaurs on land had been dying for millions of

years. He found fewer different types of dinosaurs as he came closer to 63 million years ago.

Big changes in the earth were also happening at that time. Oceans started to shrink. Many animals may have lost their homes and food supplies. The climate also changed. Studies of undersea rocks show a sharp drop in temperature, followed by a longer rise. Dinosaurs, like all of today's reptiles, were usually thought to be

cold-blooded. They needed steady temperatures to live and mate. If the climate changed too much too quickly, they would soon start to die.

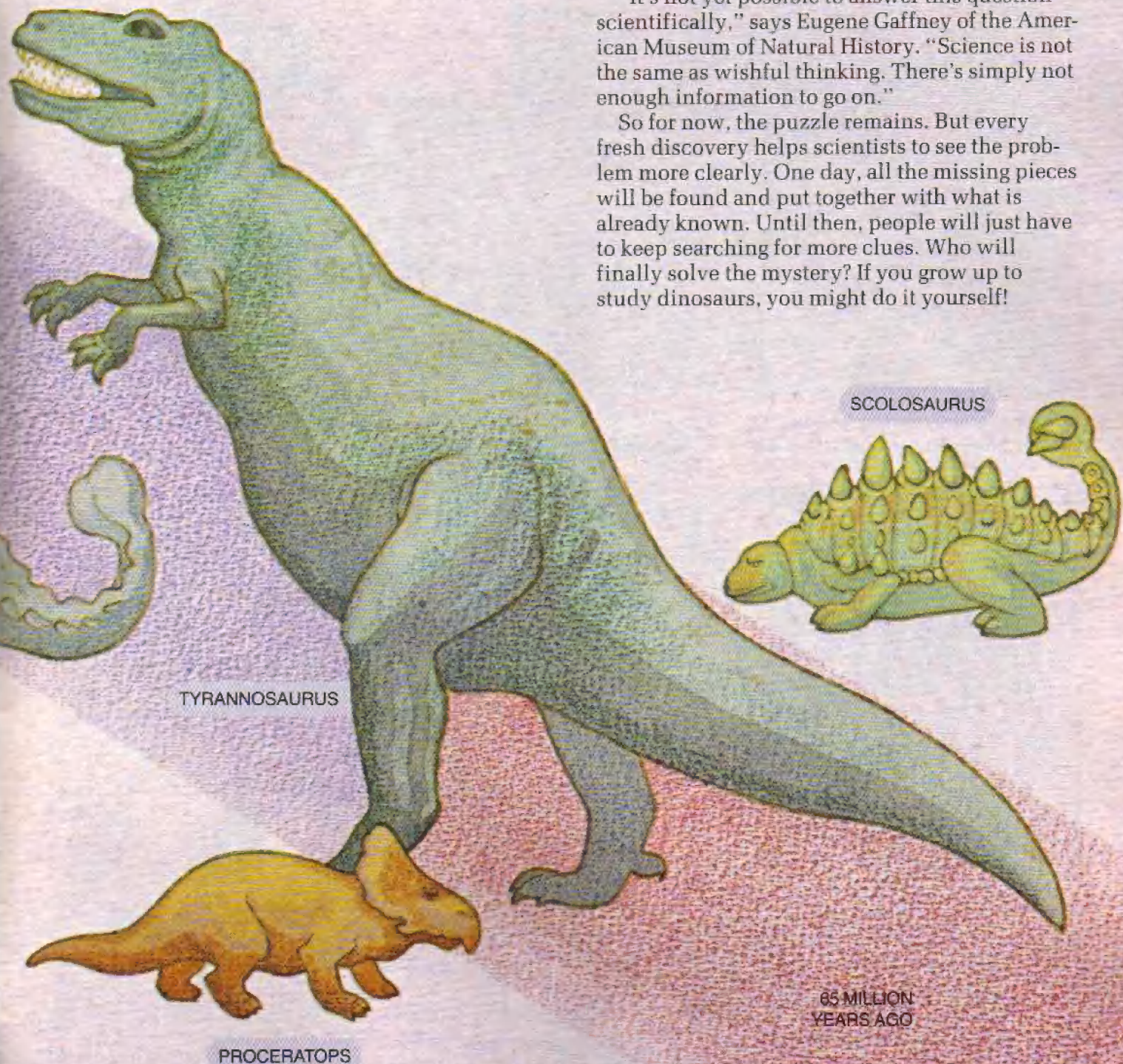
Dr. Hickey does admit that an asteroid could also have hit earth and spread iridium over the world. This might have darkened the skies long enough to kill the few dinosaurs that were left.

The Mystery Continues

Does anyone have the answer? Have all the clues been found? What do you think caused the mysterious death of the dinosaurs?

"It's not yet possible to answer this question scientifically," says Eugene Gaffney of the American Museum of Natural History. "Science is not the same as wishful thinking. There's simply not enough information to go on."

So for now, the puzzle remains. But every fresh discovery helps scientists to see the problem more clearly. One day, all the missing pieces will be found and put together with what is already known. Until then, people will just have to keep searching for more clues. Who will finally solve the mystery? If you grow up to study dinosaurs, you might do it yourself!



TYRANNOSAURUS

SCOLOSAURUS

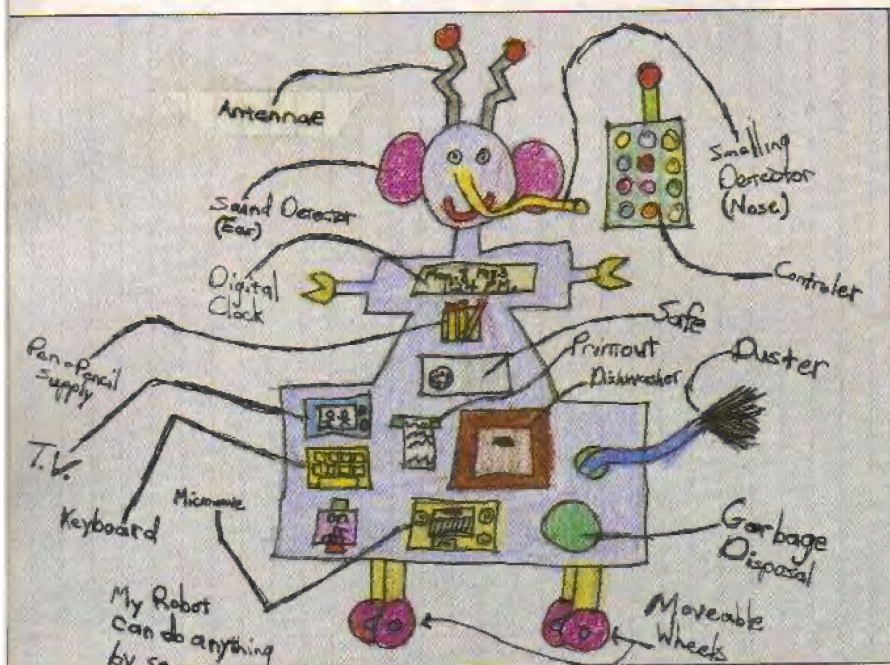
PROCERATOPS

65 MILLION
YEARS AGO

MAIL

Contest Winners

Back in June 1983, we asked for your ideas of a fantasy robot. Here are some of our favorites:



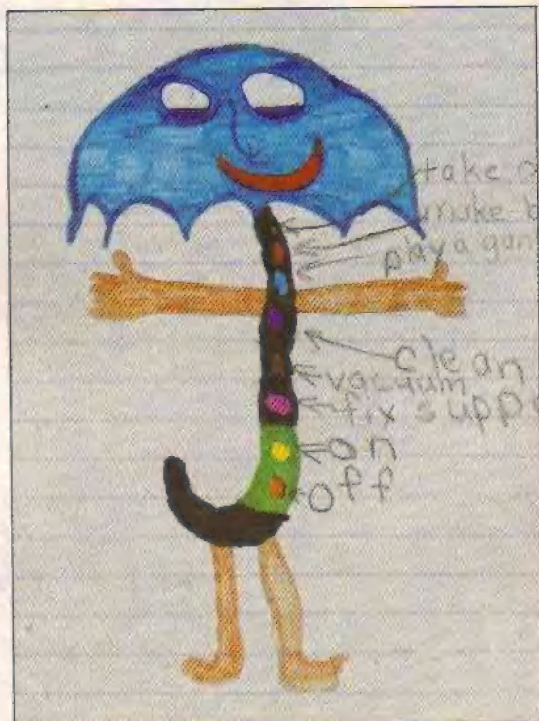
Rebecca Israeli, Spring Valley, NY

Use the controller and tell this robot to do anything.



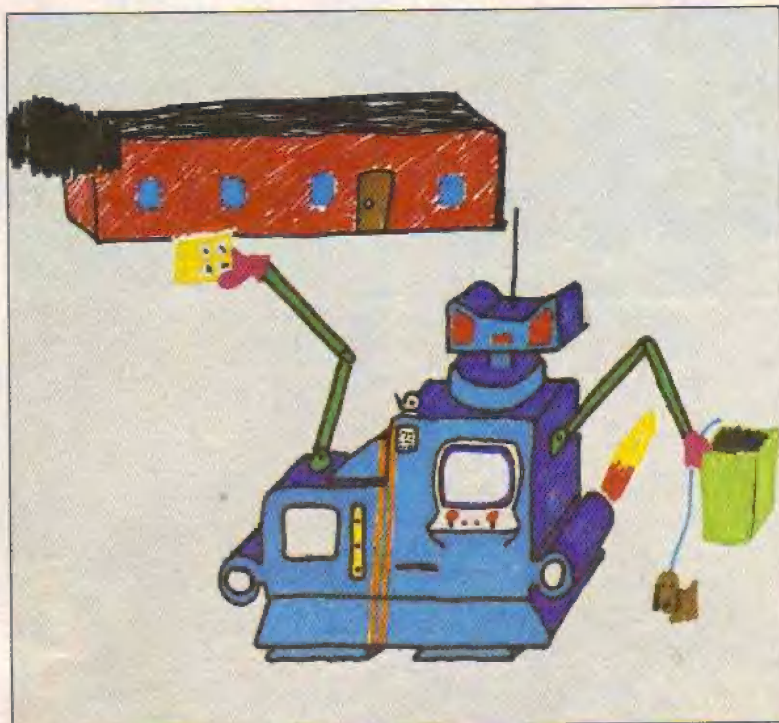
Michele Heaslip, Newton Square, PA

J.J. roller skates and shows you films.



Michelle D. Petty, Taylorville, IL

The Umbrellbot cooks, cleans and plays games.



J.J. Ireland, Hanover, IN

EFYR—Easy For You Robot—blasts you to the nearest pizza parlor.

Contact Reports Report

Dear CONTACT,

I would like to know how you get your Contact Reports. Do people write and tell you this or do you go find out about it? Please tell me!

Monica Vieson
Centerville, Ohio

Dear Monica,

Actually, you almost answered your own question. Sometimes, we read in another magazine or newspaper about an event or invention that we think kids would like to know about. Other times, people send us letters with ideas.

But the way that we like best to get our Contact Reports is from you, our readers. That's why we want you to send us any articles you see that you think might belong in the Contact Report. If we use your idea, we'll send you a T-shirt. To find out just what to do, turn to page 25.

Crazy Question?

Dear 3-2-1 CONTACT,

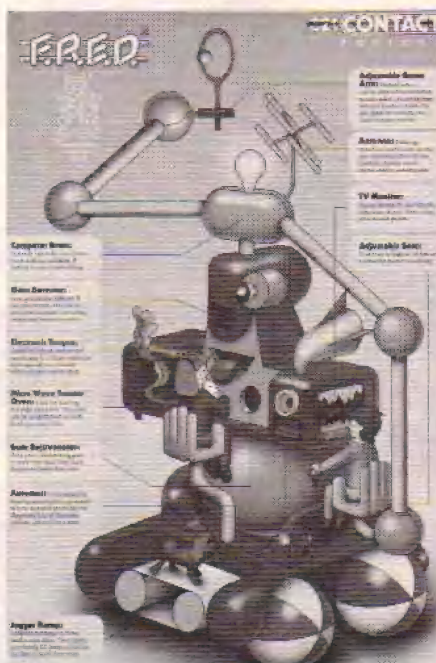
What I've been wondering since I've subscribed to 3-2-1 CONTACT is how do you find all the answers to the questions that you receive for Any Questions? It might sound crazy to ask but I want to know. I know you can't answer all the questions, but please answer mine.

April Jones
St. Louis, Missouri

Dear April,

We don't think your question about our questions is crazy at all. There are a number of ways we find the answers to the questions in the Any Questions? department. Some can be found easily in books and encyclopedias. Others aren't so easy.

Take the balloon question in this month's issue, for example. To answer that question we had to find a balloon manufacturer. First we called a toy company. They gave us the name of a balloon maker in Ohio. When we spoke to the manufacturer, he explained the entire process to us. Then we explained it to you!



Fact or Fiction?

Dear 3-2-1 CONTACT,

In your June 1983 issue, you had a story about Fred the robot. I would like to know if there are plans to make Fred. How much would Fred cost to build? Will you please send me the details?

Tony LaSalle
Edina, Minnesota

Dear Tony,

You weren't the only person who wrote in thinking that Fred was a real robot. Other readers also thought so. But, unfortunately, Fred is too good to be true. We made up our home robot and then an artist drew its picture. So we can't send you any more information. There isn't any except in

our imagination...or yours!

Of course, there are real robots, as you may know if you read the robot story in that June issue. Some are programmed to direct traffic, shear sheep, or explore outer space. Robot experts are even working on building home robots. A robot like Fred doesn't exist yet. But who knows what else is on the way?

Sports Time

Dear 3-2-1 CONTACT,

I just got my first issue of 3-2-1 CONTACT and it's great! There is so much to learn in it. I would like to suggest a column. Would you try to put in an article on Health and Sports (especially gymnastics)?

Amy J. Cuppernell
Gouverneur, New York

Dear Amy,

Believe it or not, we were just planning our sports issue when we got your letter! You'll be able to read all about sports in our upcoming March issue.

What will be in that issue? A story about kid athletes, including a gymnast! There will also be a List of the Month on strange sports. And a story about new sports equipment. Plus, don't forget to keep on the lookout for sports week on 3-2-1 CONTACT's television show.

We Want Mail!

Dear Readers,

We really love hearing from you. The questions, ideas and complaints we get help us make CONTACT a better magazine. So why not drop us a line? We can't answer every single letter, but we do read them all. Send your mail to: **3-2-1 CONTACT: Letters**

P.O. Box 599
Ridgefield, NJ 07657

Extra!

by Rebecca Herman

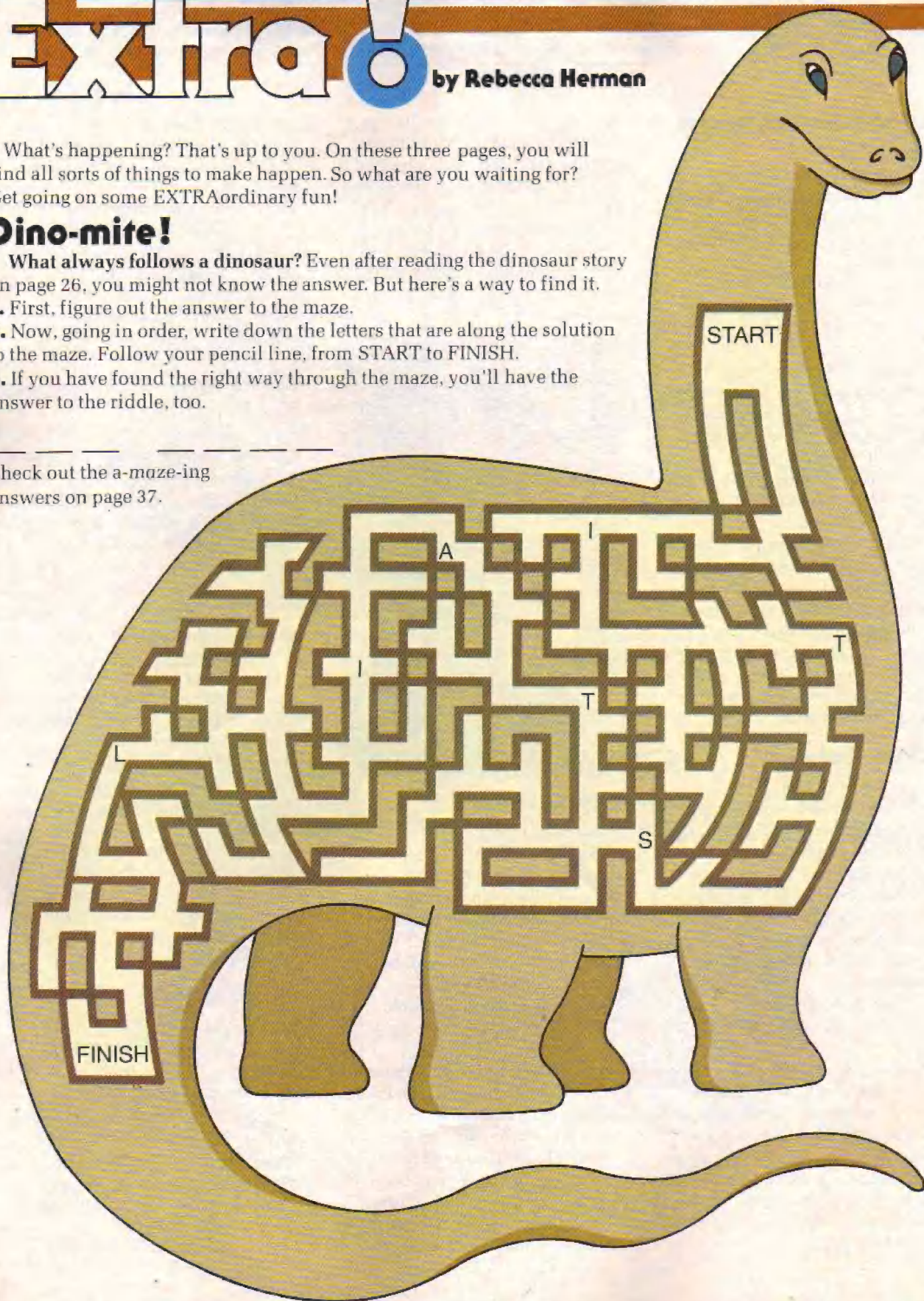
What's happening? That's up to you. On these three pages, you will find all sorts of things to make happen. So what are you waiting for? Get going on some EXTRAordinary fun!

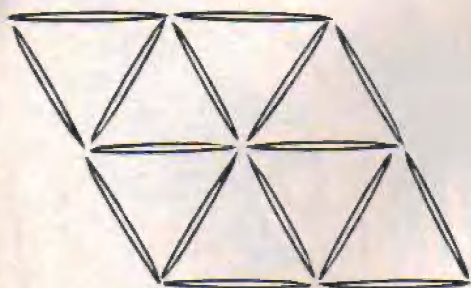
Dino-mite!

What always follows a dinosaur? Even after reading the dinosaur story on page 26, you might not know the answer. But here's a way to find it.

1. First, figure out the answer to the maze.
2. Now, going in order, write down the letters that are along the solution to the maze. Follow your pencil line, from START to FINISH.
3. If you have found the right way through the maze, you'll have the answer to the riddle, too.

Check out the a-maze-ing answers on page 37.





A Picky Trick

George Washington's birthday is on February 22. To celebrate, you get a day off from school on Monday, February 20. There's another reason to celebrate on that day. It's when 114 years ago, the toothpick manufacturing machine was invented. You can remember the day by doing a toothpick trick.

1. Set up 16 toothpicks as you see here.
2. Now remove four toothpicks so just four triangles of the same size remain.
3. Find the answer on page 37. Then clean your teeth!

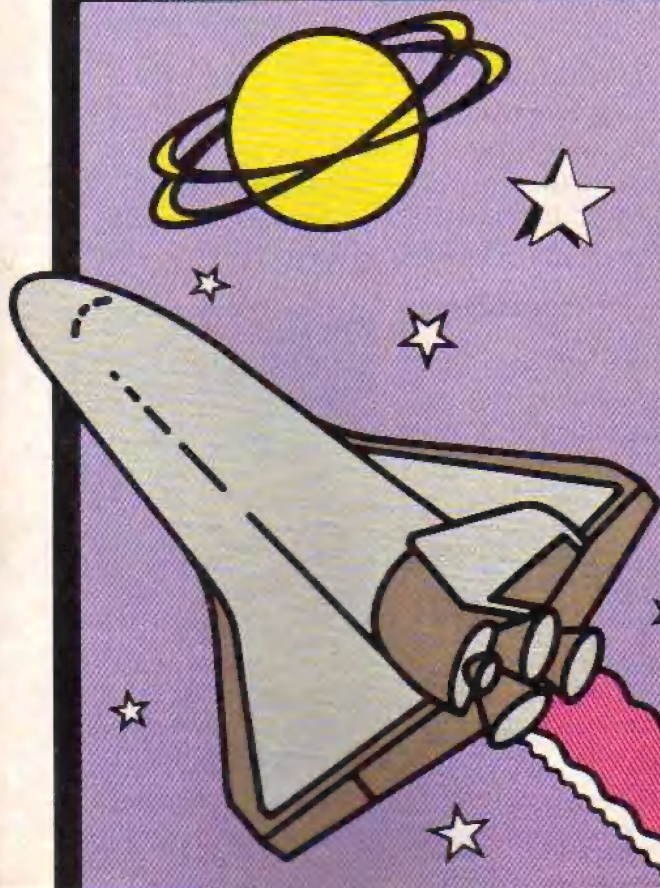
3-2-1 Contest

Using some heart facts,
make up a rhyme
And enter our contest, okay?
Because this is the month
when it is time
To celebrate Valentine's Day.

Our little Valentine's Day poem should give you a start in our heart contest. After all, valentines are heart-shaped and they usually have poems, right? Use any of our heartening facts and any others you can find. Make up a poem. It doesn't have to rhyme, but it must have real facts about the heart. We'll print our favorites in a future issue, and the winners will get CONTACT T-shirts.

- ★ Your heart is a muscle.
 - ★ Your heart is about the size of your fist.
 - ★ During your lifetime, your heart will beat more than two billion times.
 - ★ When you exercise, your heart beats faster.
- Send us your poem, along with your name, address and T-shirt size. Write to:

3-2-1 Contest: Heart
P.O. Box 599
Ridgefield, NJ 07657



Spacey Sendaway

After reading about the space camp on page 4, you know a little bit more about how astronauts survive in space. Even if you can't attend space camp, you can find out more about living in the space shuttle. The space center in Houston is all set to send you more information, along with a picture or two. Just send them your name and address.

Write to: **The Johnson Space Center**
Mail Code AP4
Houston, TX 77058

Ask for "Living in the Space Shuttle (CTW)"

Extra!

Some Shady Business

What's the same size and shape as a groundhog but doesn't weigh anything? A groundhog's shadow! The story is that on February 2, if the groundhog sees its shadow and goes back in its hole, six more weeks of winter are ahead. But if the groundhog stays out, spring is just around the corner.

You can use your own shadows to create some animals yourself. All you need are a wall, your hands and a light. To make the shadows, the light must come from behind your hands. Experiment with the light for the best results.

- 1. Bird:** To flap the wings: Keep fingers together. Move them slowly.
- 2. Rabbit:** To make the ears wiggle: Wiggle your fingers. To make the nose twitch: Move your thumb a little bit.
- 3. Dog:** To make it bark: Move your pinky up and down. When the mouth opens, say "arf!"
- 4. Deer:** To make it look around: Move both hands.



Find the Phony

Now you see 'em, now you don't. That's how some animals defend themselves from their enemies. They blend right in with the scenery. So you might be able to see them only by looking very closely. Some creatures, such as the ones in the story on page 16, keep out of danger by

imitating other animals. Still others stay safe by looking like plants.

Of the animals you see here, there are three that defend themselves by using their special ability to hide. The other one is a fake. Can you find the phony? **Answer on page 37.**



- 1.** A treehopper leaps from tree to tree. When it is at rest, this insect looks just like a tiny green thorn.



- 2.** The leaf katydid hides itself by standing upside down and imitating a leaf.



- 3.** The stick of butterfly's bright yellow color hides it among the flowers where it collects pollen.



- 4.** A spanworm caterpillar mimics a twig. It just attaches itself to the end of the branch.

Did It!

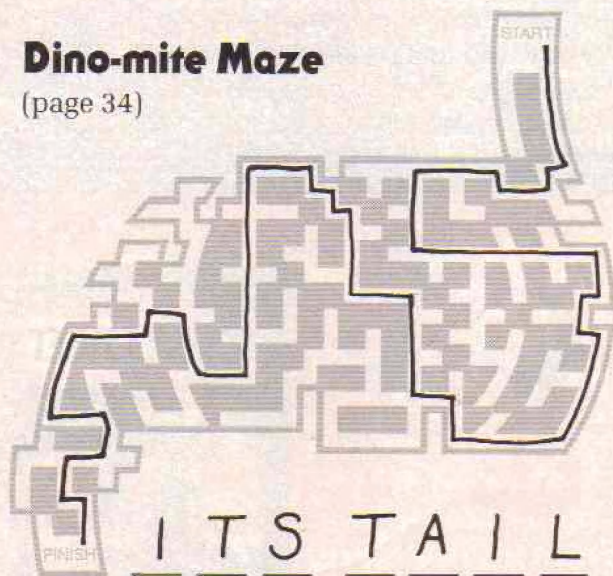
Here's Looking At You! (pages 20-21)

From top to bottom:

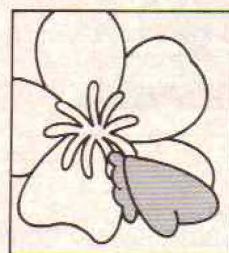
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Dino-mite Maze

(page 34)

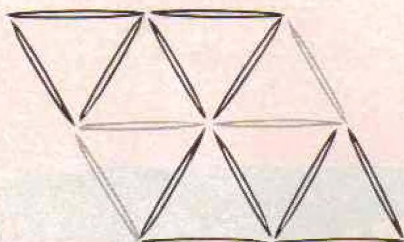


Find the Phony (page 36)



Thank You! Thanks to John Ostrom for his advice on the dinosaur story. Dr. Ostrom is Professor of Geology at Yale University and Curator of Vertebrate Paleontology at the Peabody Museum. Also, thanks to Mary Tota, student intern, for help in preparing this month's issue.

A Picky Trick (page 35)



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Next Month!

Here's a sample of what you'll find in the next issue of 3-2-1 CONTACT:

Young Athletes

Meet five teen-age athletes who are champions in their sports.

How Far to Go?

Are there limits to the sports records that people can break? Find out.

Bloodhound Gang

Vikki, Ricardo and Skip are all set to solve a new mystery.

Plus Factoids, Letters, a Poster and Much More!

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MAIL TO: Enter Magazine
One Disk Drive, P.O. Box 2685, Boulder, CO 80322

Subscriptions to Canada and other countries, \$20.95. Please remit in U.S. currency. Allow 6-8 weeks for delivery.

8HJT8

INFORM WITH ENTER

NEW-ENTER Magazine. The fun way for your child to learn computer skills, understand computer technology and even become a video game champ. Ten issues bring programs, quizzes, puzzles and features that involve 10-16 year olds and encourage them to become competent computerites. And you don't need a computer in your home to make it work!



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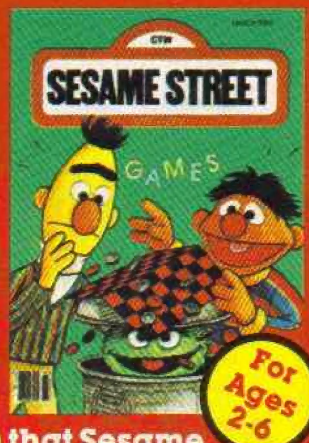
MAIL TO: Sesame Street Magazine
P.O. Box 2894, Boulder, CO 80322

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8HJT8

ENTERTAIN WITH ELECTRIC COMPANY

The Electric Company Magazine—as creatively entertaining as the T.V. show kids love. It's amusing, playful, absorbing and educational for beginning and young readers. Enjoy ten colorful issues filled with puzzles, posters, cut-outs, Spidey super stories, jokes...and sunny smiles.



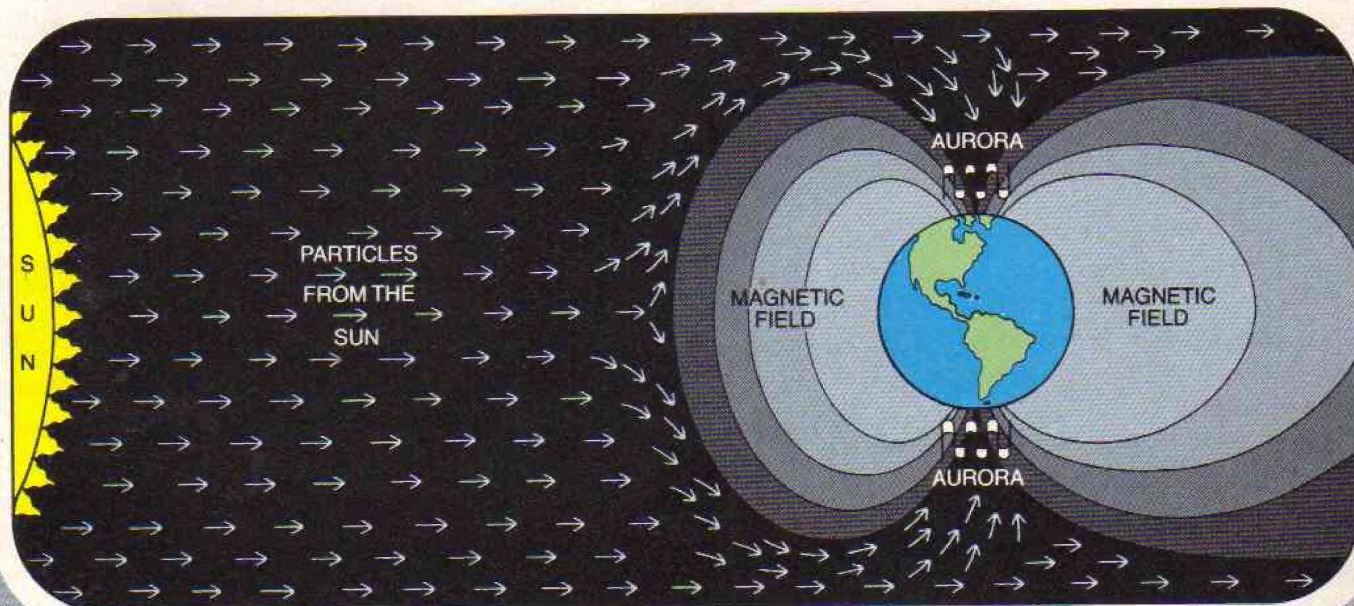
Earthfacts: Auroras

Each month CONTACT will bring you another *Earth Works*. Save these pages in a notebook. Soon you will have your own guide to the wonders of the planet earth.

EarthWorks

- ☉ If you've never seen an aurora (uh-ROR-uh), don't be surprised. There are only certain places where the conditions for them are right. In parts of Alaska or northern Canada you might see an aurora three times a week. In the northern part of the rest of the United States, conditions might be right just 12 times a year. But because of lights, clouds and air pollution, you will see auroras less often than that.
- ☉ Auroras are caused by particles that shoot out from the sun. When they reach earth they slam into particles of the earth's atmosphere. The particles in the atmosphere absorb the jolt and lots of energy. Later they give off that energy. Part of it is light that can be seen. Since so many particles in the atmosphere are giving off light at the same time, the sky glows. And that makes an aurora.
- ☉ Long ago, people created strange stories to explain auroras. Eskimos said the lights came from lamps carried by spirits. European Vikings thought auroras were a reflection from a huge fire burning around the edge of the earth.
- ☉ You can't see an aurora in the daytime—even if it's there. Sunlight is so much brighter that it blocks out the aurora's light.
- ☉ Auroras can be any color. It depends on how fast the particles that hit the atmosphere go. And it depends on what kind of particles they are. Solar particles hitting oxygen can cause green or even red. Particles hitting other elements at other speeds create different colors.
- ☉ The auroras of the far north are the *aurora borealis* (bor-ee-AL-is), meaning northern lights. Those of the far south are the *aurora australis* (aus-TRAIL-is), or southern lights.
- ☉ Huge auroras are superstorms. They occur when there is lots of activity on the sun and more particles shoot toward earth. At these times, auroras can be seen as far from the poles as the equator.
- ☉ Scientists watch the sun to find out when auroras will happen. They use instruments on satellites that record solar particles as they pass into the earth's atmosphere.

Below: Particles from the sun hit earth's magnetic field. They follow it to the ground at the poles. When the particles hit the atmosphere they cause the glow of an aurora.





EarthWorks

Auroras

This glow in the sky isn't an optical illusion. It's not trick photography. And it's not some kind of weird UFO. But if you think the cause of this light show is out of this world, you are on the right track.

These lights are called auroras. They happen when particles shooting out from the sun, at up to one million miles per hour, strike the earth's atmosphere. Auroras are spectacular sky lights that dance and flicker and glow in all colors of the rainbow.

For more on auroras, turn to page 39.

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